

FILE DESCRIPTION

PHILADELPHIA FILE

SUBJECT HARRY GOLD

FILE NO. 65-4307

VOLUME NO. 1-B-10

SERIALS (1)

thru

(4)

## NOTICE

**THE BEST COPIES OBTAINABLE ARE INCLUDED IN THE REPRODUCTION OF THE FILE. PAGES INCLUDED THAT ARE BLURRED, LIGHT OR OTHERWISE DIFFICULT TO READ ARE THE RESULT OF THE CONDITION AND OR COLOR OF THE ORIGINALS PROVIDED. THESE ARE THE BEST COPIES AVAILABLE.**

File No: 65-4307Re: HARRY GOLDDate: 3/78  
(month/year)

Serial	Date	Description (Type of communication, to, from)	No. of Pages		Exemptions used or, to whom referred (Identify statute if (b)(3) cited)
			Actual	Released	
1	6-6-50	BULKY EXHIBIT INVENTORY FORM	1	1	
	6-6-50	ENVELOPE DESCRIBING ENCLOSURES	1	1	
	6/6/50	MANILA ENVELOPE/ENCLOSURES	1	1	
	6/6/50	ENVELOPE WITH LAB IDENT	1	1	
	6/6/50	MISC. NOTES ON POWDER PLANT	11	11	
2	6/6/50	ENVELOPE DESCRIBING ENCLOSURES	1	1	
	6/6/50	MANILA FOLDER/ENCLOSURES	1	1	
	6/6/50	ENVELOPE WITH LAB IDENT	1	1	
	6/6/50	FOLDER #2 WITH DOCUMENTS	57	57	
3	6/6/50	ENVELOPE DESCRIBING ENCLOSURES	1	1	
	6/6/50	MANILA FOLDER/ENCLOSURES	1	1	
	6/6/50	ENVELOPE WITH LAB IDENT	1	1	



HARRY GOLD  
ESPIONAGE R  
65-4307

THIS MATERIAL IS LOCATED IN THE BULKY KIBBITZ ROOM

- (1) Six sheets of yellow paper in Gold's writing captioned "Magnesium Powder Plant"
  - (2) Two sheets of yellow paper bearing Chem Formulas numbered 10 thru 100 (but 7 and 8)
- Manila Folder bearing caption "Dick Briggs" with approx 60 pages of typed and handwrit notes to effect that it is material from estate of R. Briggs; also containing: a chart captioned "List of Cellulose Esters, a chart bearing #3 and listing various experiments by number; a diagram showing circulation of solvent; a sheet captioned Paramount West Coast Laboratory; and a sheet bearing caption FORMAMIDE(CH).
- Manila folder captioned "Mr. Baybutt, Dope Inventories Usage and Losses, 3d Period 1942" also contains 11 graphs all black stamped Apr 22, 1942, and one graph captioned Plasticizer Inventories, Usages and Losses 3d period 1942.
- A Manila folder containing 59 reports on Sub Conferences from Oct 2, 1936 thru Apr 1, 1939; and also: a report on Plate Coating Tests Modified R-21 Dope; a report on plate coating tests modified R-21 Dope, dtd 10-3-35; Seven graphs on R. Gelatin Experiments; method of operating machines above upper explosive limit; minutes of mtg, Sept 27, 1937; report on improved "Kodatrace"; proposed changes in Windup for Machines located in Bldg 20; memo to Mrs E. E. Taylor Bldg 46, Dec 19, 1935

ABOVE ITEMS WERE OBTAINED IN SEARCH OF GOLD RESIDENCE AT 6823 WINDRED ST, PHILADELPHIA ON 6-6-50. ITEMS #1, 2, and 3 WERE OBTAINED BY SA FRED C. BIRNEY; ITEM #4 WAS OBTAINED BY SA FORREST F. BURGESS.

AB Q

ENVELOPE IS FULL--ENTER NO MORE MESSAGES

Sent to Bureau Feb 6-12-50  
Ret'd from Bureau 7-18-50

Return 11/14/58  
PS

Return 11/10/59  
Retained 6/27/60

Return 5/3/67  
Return 2/13/68

65-4307-18-10  
FBI - PHILADELPHIA  
JUN 12 1960  
1074

sent Paris 1/10/48

ret'd for  
Jul 7 - 1948

Date Received

1/10/48

From

Search of Old Records  
(Name of Contributor)

6823

1500 1/2 St. Phila  
(Address of Contributor)

By

Fred C. Bishly  
(Name of Agent)

To Be Returned

Description:

- (1) 4 sheets yellow paper in folder writing captioned Magnesium Powder Chart
- (2) 2 sheets yellow paper bearing chem formulas handwritten

File No

~~65-4307-1-B-10~~ as shown 100  
65-4307-1-B-10 (2)

~~Handwritten scribbles and illegible text at the top of the page.~~

~~Handwritten notes in the middle section, including:~~  
~~1. 10/15/50~~  
~~2. 10/15/50~~  
~~3. 10/15/50~~  
~~4. 10/15/50~~  
~~5. 10/15/50~~  
~~6. 10/15/50~~  
~~7. 10/15/50~~  
~~8. 10/15/50~~  
~~9. 10/15/50~~  
~~10. 10/15/50~~

ITEM # 1

PHILA FILE # 65-4307-18510(1)





This material is  
from the 67 loose  
papers found in the  
wooden box in the  
basement JMS

1191

Powder Plant

6/6/50  
JTB

Objective: plant having a capacity of 15,000 lbs.  
pulverized mg/day  
To be atomized

6/10/50  
200

## Magnesium Powder Plant

### Objective

1. Plant having a capacity of 15,000 lbs. of pulverized Mg/day.
2. To be geared for continuous operation.
3. To be equipped for welding powder in four classified ranges of particle size.
4. Circuit to be as per one flow sheet, Drawg no. A.

### Melting Data

#### Mg Constants

##### Specific Heat

@ 60°F = 0.2492 @ 140°F

@ 328°F = 0.3335 @ 617°F

@ 625°F = 0.4352 @ 1157°F

Specific Gravity @ 62°F = 1.74

atomic weight = 24.3

Melting Point = 1484°F

Latent Hl. of Fusion =  $70 \frac{\text{gm-cal}}{\text{gm}}$

#### (a) Heat Load

- (1) to bring the metal up to melting point assuming max specific heat (@ 1157°F. (spec.))

6/6/50  
200

$$\frac{15,000 \text{ lbs.} \times 0.45 \times 570}{1000} + (1000 \times 60) = 210,000 \frac{\text{B.T.U.}}{\text{hr.}}$$

(b) To melt metal

$$\frac{15,000 \text{ lbs.} \times 0.45 \times 140}{1000} + 15 \times \frac{570}{1000} = 79,700 \frac{\text{B.T.U.}}{\text{hr.}}$$

(c) To bring metal up to 1500°F,

assuming c.p. = 0.45 B.T.U.

$$\frac{15,000 \text{ lbs.} \times 0.45 \times (1500 - 1000)}{1000} = 30,000 \frac{\text{B.T.U.}}{\text{hr.}}$$

Total Direct Load: 470,100  $\frac{\text{B.T.U.}}{\text{hr.}}$

(c) The molten metal is raised to a temp. of 1500°F in the present operating plant before atomization

Let us assume that the furnace temp is 1800°F, that the material of construction of the furnace pot is cast iron, that the heat-receiving surface amounts to 20 sq ft of 1". Then the outside diameter temp of the pot would have to be :-

$$470,100 = 0.174 (0.64) \left[ \left( \frac{1800 - 200}{100} \right)^4 - \left( \frac{V}{100} \right)^4 \right] 225$$

$$1,906,710^4 = 261,810^4 - \left( \frac{V}{100} \right)^4$$

$$261,810^4 - \left( \frac{V}{100} \right)^4 = 1,906,710^4$$

$$\left( \frac{V}{100} \right)^4 = 261,810^4 - 1,906,710^4$$

$$V^4 = 24,400,000^4$$

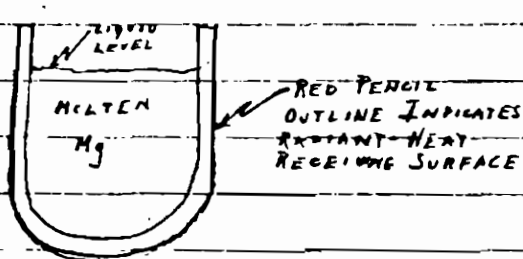
$$V = 21,000,000^2$$

where 0.64 is taken to be the emissivity of the hot surface in the given temp range

6/10/50  
P.M.

or, which means,

$472,100 = 460 \times 17.6 \times \Delta T_{\text{out}} \times 1/11$   
 Thus the thermal load across the pot (from the outside air to the molten metal film) is :-



Having outlined upon the above diagram, and assuming that the pot surface in contact with the metal bath to be roughly equal to  $26400 \text{ ft}^2$  as well. If now we take the overall coeff. of ht. transfer to be  $8 \text{ B.T.U.} / \text{ft}^2 / \text{hr} / \text{°F}$ , the required ht. transfer surface would amount to :-

$$\frac{472,100}{8(26400)} = 227 \text{ ft}^2$$

∴ this the overall coeff. recently obtained in the plant equipment

|| The above method of computation assumes that the sole source of ht. transmission is to the

U/6/20  
700

put is from the refractory lining of the furnace  
+ is in manifestly a well-justified part of the  
design shown on Page B, as far as heat  
would be radiated directly from the burner  
planes to the kettle and insofar as heat  
would also be radiated + convected from the  
fluid combustion products to the kettle. Checking  
with the charts available in "Trink's Industrial  
Furnaces" (in which combine all of the factors  
named above) substantiates the computation.

The above computation illustrates that  
for the given furnace temp., thermal load,  
& heat-receiving & heat-discharging surfaces  
it is possible to slip the required heat  
load into the water metal. It is now  
important to determine whether the Mg bricks  
changed to the water metal would accept  
the heat at the required rate. For rough  
estimation purposes assume each brick weighs  
24 lb. our demand is:-

$$\frac{12,000}{(24)(24)(60)} = 0.454 \text{ bricks/minute.}$$

If assumed:-  
a. that the bricks are 14" lg. 4 1/2" wide. 4 1/2" h.

C

O

⊙

6/10/50  
R.D.

b. that the preheated film of dark brick attain a temp of 1000°F immediately upon immersion in the molten metal mass.

c. that the diffusivity of the brick material is 5 ft<sup>2</sup>/sec. (7 min<sup>2</sup> "industrial furnace")

d. that a final core temp of 1195°F is desired

e. that an initial core temp of 61°F is obtainable

If we furthermore assume no dimensional change of the brick and, due to melting, do not proceed to determine the soaking time required to establish the final core temp. of 1195°F:

$$\frac{(1000 - 1195)}{(1000 - 61)} = 0.00439 = \frac{\text{final core to soaking temp diff}}{\text{initial core to preheat temp diff}}$$

From Table 1, Fig. 65, Industrial Furnace:

$$\frac{dT}{dt} \text{ would then} = 0.00$$

where  $d$  = the diffusivity of the material,  $t$  = the time in hrs to achieve the final core temp.

$d$  = the total thickness in ft. of the material

$$\text{then, } t = \frac{(0.00) \left(\frac{4.5}{12}\right)^2}{0.00} = 0.010 \text{ hrs.}$$

30. Calcium carbonate + chloric acid
31. Hydro-sulfuric acid + Arsenic sulphate
32. Nitrogen pentoxide + water
34. Chlorous acid + lead
35. Nitrogen trioxide + Zinc oxide
36. Sodium cyanide + sulfurous acid
37. Ammonium carbonate + Barium chlorate
38. Hydrogen sulphide + silver chlorate
39. Calcium sulphide + sulphurous acid
40. Silver nitrate + phosphoric acid
41. Zinc + sulphur
42. Hydrogen + mercurous oxide
43. Hydrogen + Chlorine
44. Cobaltous chloride + sulphuric acid
45. Mercurous sulphite + hydrochloric acid
46. Ammonium cyanide + sodium hydroxide
47. Chromic chloride + ammonium hydroxide
48. Ferric carbonate + nitric acid
50. Sulphur dioxide + water
52. Sodium chloride + sulphuric acid + oxygen
55. Bromine + cadmium iodide



- 10 Magnesium oxide + water
- 11 Silver sulphate + magnesium chloride
- 12 Sodium carbonate (heated)
- 13 Phosphorus pentoxide + Barium oxide
- 14 Barium hydroxide + sodium sulphate
- 15 Ammonium chloride + Calcium hydroxide
- 16 Mercuric carbonate + sulphuric acid
- 17 Nickel + Bromine
- 18 Cuprous oxide + Hydrogen
- 19 Mercuric oxide (heated)
- 20 Aluminium + Bismuth bromide
- 21 Sulphur trioxide + stannous oxide
- 22 Iron + sulphuric acid
- 23 Lead carbonate + hydrochloric acid
- 24 Bismuth + oxygen
- 25 Sodium hydroxide + aluminium
- 26 Sodium chlorate (heated)
- 27 Strontium oxide + water
- 28 Manganese dioxide (heated)
- 29 Magnesium oxide + Carbon dioxide

6/6/50  
M

56. Mercuric chloride + manganese dioxide + sulfuric acid
57. Dilute nitric acid + copper
61. Ferrous phosphate + potassium dichromate + phosphoric acid
62. Ferric chloride + stannous chloride
63. Stannous chloride + mercuric chloride
64. Silver nitrate + potassium permanganate
65. Mercurous nitrate + potassium permanganate + H<sub>2</sub>SO<sub>4</sub>
66. Concentrated nitric acid + silver
67. Manganese dioxide + hydrochloric acid
68. Lead nitrate + potassium permanganate
69. Iodine + cold dilute calcium hydroxide
70. Copper + conc. sulfuric acid
71. Phosphoric acid + calcium bromide
72. Chlorine + hot conc. potassium hydroxide
73. Sulfur + dil. nitric acid → sulfur dioxide
74. Hydrosulfuric acid + ferric chloride
75. Calcium phosphate + sulfuric acid
76. Chlorine + hydrogen sulfide
77. Stannous chloride + potassium permanganate + sulfuric acid

78. Lead chloride + bromine + sulfuric acid
79. Potassium permanganate + hydrogen sulfide +  $H_2SO_4$
80. Aluminium hydroxide + perchloric acid
81. Potassium permanganate + magnesium iodide + phosphoric acid
82. Potassium chromate + hydrogen sulfide + sulfuric acid
83. Hydrosulfuric acid + sulfur dioxide
84. Potassium dichromate + sodium hydroxide
85. Silver + conc. sulfuric acid
86. Chlorine + manganese dioxide
87. Sodium dichromate + zinc chloride + sulfuric acid
88. Potassium permanganate + manganous sulfate + water
89. Barium chloride + sulfuric acid
90. Cobaltic iodide + calcium permanganate + sulfuric acid
91. Silver nitrate + potassium chromate
92. Hydrogen sulfide + iodine
93. Manganous chloride + potassium permanganate +  $H_2SO_4$
94. Manganous chloride + potassium permanganate + water
95. Calcium hydroxide (Hot. conc.) + iodine

sent Bureau 6-12-60  
Beld from  
Jul 7-18-60

Date Received 6/14/60  
From Search of J. J. Beld's Residence  
(Name of Contributor)  
6827 Kindred St, Phila  
(Address of Contributor)

By Fred C. Beld  
No. ( )  
To Be Returned (X)

Disposition:  
see above  
File No. 65-4307-1-B-10(2)

Contents:  
Manila folder  
bearing caption "Dick  
Briggs" with copy of  
60 pages of typed and hand-  
written notes to effect that  
it is material from estate of R.  
Briggs:  
- chart captioned "List of Children  
of Dick Briggs"  
- chart listing various specimens by number  
of Briggs showing circulation  
of solvent  
- chart captioned "Parsons  
West Coast Laboratory"  
- sheet bearing caption "Parsons"

This material  
not an  
exhibit

sent  
reported  
to  
Albany

- Manila folder bearing  
caption Dick Bragg  
with approx 60 pages of  
typewriter and handwritten  
note bearing note to effect that  
it is material from estate of R. Bragg
- A chart captioned list of cellulose ester
- A chart bearing 23 listing various  
experiments by number
- A diagram showing circuitry of solvent
- A chart captioned Paramount West Coast  
Laboratory caption FODAMIDE (C)
- A sheet bearing caption FODAMIDE (C)

ITEM # VI

PHILA FILE # 65-4307-1B-10(2)



11/6/5  
20

Dick Briggs

This is from  
Folder #13 w/b  
(found in wooden box  
in basement)

Dr



COOPER

COOPER, Monier, Christl, Crowley, Payne.

**Old Work: Gas Scrubbing.**

Assistance in Calcium Propionate Manufacture.  
Assistance in Liquefaction of Cake-Oven Gas.  
Testing Design of Bubble Plates for Aeration.  
Follow Acetic and Propionic Acid Developments.  
Absorption Refrigeration.

**Mountain Aeration:**

Extension of the short stack to carry release gases away from the aeration bed has not yet been completed.

**Gas Scrubbing:**

Operating records of the last few months are being analyzed. The results will appear in the report on the operation of B-3 (bubble plate) scrubber.

**Absorption Refrigeration:**

B-mountain water temperatures have risen to above 15 degrees C during the week, in spite of indicated refrigeration of nearly 1500 tons. This rise was partly due to use of B-4 as a final scrubber.

**Acetic and Propionic Acids:**

Final criticisms of acetic and propionic acids distillation flow sheets were made this week in conjunction with members of the operating and engineering sections.

Instrumentation of the acetic acid synthesis flow sheet was completed.

Work on a preliminary operating manual for propionic acid has been started.

9/24/57.

DE ROPP, Wetherington, Forbes, Gordon.

Old Work: Urea Plant Operation.  
Agricultural Urea.  
CO for Acetic Acid.  
Removal of Oxygen from Carbon Dioxide.

Results of Interest:

*mla*  
Operation of the #2 ammonia still continued to be erratic with frequent evidence of the presence of carbonate in the ammonia product and reflux lines. The following steps were taken to improve the performance of this unit: The still, condenser, and interconnecting lines were washed thoroughly. This step was found to require considerably more care and effort than had been previously considered necessary. The reflux and feed spargers were straightened, and the latter raised to a position one foot above its previous location in the column. Since Wednesday the still has shown definite evidence of improved performance, particularly in its relative freedom from carbonate troubles. However, its performance still leaves much to be desired in comparison with that of #1 still.

The oxygen analysis apparatus has required further modification to eliminate recurrent breakage. Practice in manipulation of the apparatus has required additional time. Analysis of the gases to the converters are being run today. Machine work on the oxygen removal catalyst tube has been completed and assembly will be started as soon as the heating elements are received.

9/24/37

MOSES, Gray, Gordon, Putnam, Smalley, Williams.

Old Work: Thylex Operation.  
Generator Operation.  
Coke-Oven Gas Purification.  
Coke-Oven Gas Liquefaction.  
Chlorination of Cooling Water.  
Fuel Gas Control.  
Miscellaneous Coke Oven By-Products Recovery.  
Disposal of Acid Sludge from Light Oils Refining.  
Checking of Analytical Methods used in Boiler Control.

Thylex: Operation has continued unsatisfactory thruout the week chiefly because sufficient air is not yet available. The installation of the air line from the new B-plant compressors has been completed and is expected to be put in service today. A stilling baffle to be installed in the second pass of one of the thimblers is under construction.

Generator House: The preliminary reason sheet for replacement of Western Gas Set generators with some grate and water-jacketed U.S.I. type is nearly completed.

The Koppers type steam decomposition motor, ordered on approval, was received during the week and will be tried out as soon as possible.

Tests on the experimental bar screen on # 15 set have been held up due to pressure of other work and some necessary modifications in the collection and storage system for the screenings. Some short runs, however, were made and seemed to indicate excellent separation of fines from the coke charged, even with coke of high moisture content.

Disposal of Acid Sludge:

A small scale furnace is now under construction to permit further experimental investigations.

Coke-Oven Purification:

The up-river (or #3) scrubbing train was taken out of service on Thursday primarily to permit the cleaning of the oil and caustic scrubbers. Although the rings of both scrubbers were heavily laden with a deposit, those of the oil scrubber were in a particularly foul condition, a steam purge being necessary to facilitate their removal. Analyses indicate that the deposit

Masses

was composed chiefly of the sulfide and carbonate salts of iron in the case of the oil scrubber, and of the same salts of both iron and sodium in the case of the caustic scrubber. Very little naphthalene was present in either case. The rings showed a definite effect of corrosion.

6/6/37  
70

Liquefaction:

Leaks in the second exchangers of A-3 and A-4 columns have necessitated the operation of A-1 column on coke-oven gas with A-3 taking the purge and residual gases. Fairly smooth operation has been experienced. The new slanting baffle tube bundle embodying recent design modifications is to be completed today and is scheduled to be installed on Monday.

9/24/37.

*Research*

ROSENBAUM, Briggs, Goldbeck, Hart, Stiles, Shuffie, Simril.

Old Work: BP-75.

Recirculation of Mixed Gas for Plant Units.  
BP-110 Distillation.  
Regeneration of Spent SMK Catalyst.

*6/10/57*

New Work: Cost Estimate for Diethyl Cyclohexylamine.

Nitrile Unit:

Run #32 is 101 hours old as of 8 AM Friday. Crystals of adipamide indicating incomplete conversion began to appear at the end of 80 hours. Reaction temperature was raised 10 degrees and the run is still continuing satisfactorily.

*adipamide*

BP-75 Hydrogenation:

Runs #56, 57, 58, were made with refined nitrile that had previously been treated with sulfur dioxide. Quality of the hydrogenated material was excellent. In run #59 some remaining untreated nitrile was hydrogenated satisfactorily.

*nitrile*

BP-110 Refining:

Some methanol BP-110 extraction liquor was refined in the 200 gallon stainless steel still. Following this the BP-110 from Custom Unit runs #13 - 35 was refined. These runs had been made with good quality refined nitrile which, however, had not been treated with SO<sub>2</sub>. The crude BP-110 however was easy to refine and yielded good quality diamine.

*methanol*

Cost Estimates:

A cost estimate was prepared for manufacture of diethyl cyclohexylamine by hydrogenation of diethyl maline. A cost estimate also is being prepared for manufacture of BP-243 flotation reagent in the Custom nitrile and hydrogenation units.

Plant Unit: Castor Oil was recommended as the lubricant for the gas circulating pump installed for the plant hydrogenation units.

Castor Oil will hydrogenate to a diol which will not impair the quality of the fordol alcohol. The circulating pump was tested out but regular operation awaits completion of instrumentation.

*Hydrogenation*

*Laurel*

A sample of recent Castor Oil was tested in the shaker tube and hydrogenated satisfactorily to good quality Opalwax. Considerable trouble was experienced in the plant units with the same oil and same catalyst because of poor quality mixed gas. Source of purified mixed gas for the plant hydrogenation unit will probably have to be shifted to the exit of A-9 guard converter as was done for the Custom Unit to obtain gas free from CO.

9/24/57.

VAIL, Hickman Jilk, Keister, LeMaster, Smith, Stiles.

*6/15/50*  
*gm*

Old Work: Alcohol Synthesis.  
 Alcohol And Contact Catalyst.  
 Contact Conversion.  
 Ammonia Synthesis.  
 Purifier Performance.  
 Low Pressure Purifier Tests.

Results of Interest:

Production to 8 AM, 9/23, of the current alcohol runs:

Unit	Age-Hrs.	Catalyst	Net Crude Lb./Hr.	T.A.	Gal. 100%/Hr.	Y.M
C-3	316	MK (5th Ser. Dichro.)	4475	88.5	585	9.7
C-4	798 (Ended 9/22)	MK (4th " " " )	4546	85.9	551	11.9
C-5	699	MK ( " " " " )	5421	89.4	695	9.0
C-7	523 (Ended 9/19)	MK ( " " " " )	5072	87.8	634	10.4
	50 (Started 9/20)	MK (5th " " " )	5446	89.9	700	8.5
C-8	412	MK (4th " " " )	4430	88.4	559	10.2
C-9	571 (Ended 9/20)	MK ( " " " " )	4500	85.1	539	13.2
	24 (Started 9/22)	MK ( " " " " )	4168	88.3	625	10.0
C-10	596 (Ended 9/17)	MK (4th " " " )	4430	87.5	551	10.8
	109 (Started 9/18)	MK (5th " " " )	4266	88.6	540	9.7
A-10	82 (Started 9/19)	KNR (1936)	5963	96.9	858	-

*in*  
*ed H?*

All units were apparently lighted off after the general shut down on 9/18 without damage.

While C-4 unit was down for catalyst change because of pressure drop a 15% larger pulley was installed on the pump motor. The cartridge had two large cakes of deposit in the middle section. Catalyst not yet dumped.

C-7 catalyst was changed while the pump was down for valve repair. Discharged catalyst showed little breakage, but some swelling near the bottom; -- little dirt on the cartridge.

C-9 was shut down for high methanation (16%) an erratic run with injection. Catalyst and cartridge were in good condition.

*where from?*

A deposit of metallic lead was found in the bottom of the cartridge, as was observed once before with this cartridge (D-12) after high methanation.

C-10 catalyst and cartridge were in excellent condition when changed.

A-10 started with KNR on 9/19, a charge reduced in Jan. The catalyst has low activity, altho the records show no higher reduction temperature than was normal for KNR at that time.

B-1 contact unit started supplying hydrogen for alcohols on 9/19.

4/6/50  
2/5

**Contact Conversion:**

New B-5 Converter is being reduced smoothly with unscrubbed converted gas admitted thru a flowmeter.

A-4 Converter catalyst expenditure amounted to 4.0 lb./T with 35 T/day average thruout.

Organic sulfur analyses show (gr. S/100 C. F.):

Date	Inlet Water Temp.	S in	B-8 Water (Rings)			B-9 Water (Plates)			B-2 Humidifier S in
			S out	/Gal.	CO <sub>2</sub> Out	S out	/Gal.	CO <sub>2</sub> Out	
5/17	11.8	5.95	0.55	1.8	0.30	0.36	2.5	0.30	-
20	10.5	4.09	0.90	2.0	0.82	0.44	2.7	0.58	-
21	13.0	-	1.02	1.6	0.43	1.06	2.6	0.43	-
22	13.6	-	0.90	1.5	0.78	0.36	2.3	0.22	0.04
23	18.6	-	0.62	1.9	0.60	0.59	1.9	0.25	0.03

**Ammonia Synthesis:**

Performance of A-9 unit is greatly improved.

**Purifier:**

Steps are being taken by the Engineering Section to improve separation before and after the purifiers. The Operating Section has ordered previous reduction for the purifier catalyst.

5/24/50.

HAYER, Burns, McConnell, Faine, Hamilton, Lewis, Roy.

Old Work: Alcohols Refining General.  
Fermaidex, ZA-3 and ZA-4.  
Isobutyl Propionate.  
Cyclohexanone and Adipic Acid.  
Dimethyl Sulfate Manufacture.  
Isobutyl Acetate.

6/6/50  
20

**Alcohols Refining:**

Information on tube cleaning equipment for the Badger condensers was received and passed on to the operating section.

X Refined methanol production passed 90,000 gallons per day. MKR crude from one unit is being mixed with MK at the heads column position. Due to the combination of high production and partially plugged condensers, reflux ratios in the refining columns has been only 1.5/1 or less. This is further evidence that with adequate stripping of MK crude, 2/1 reflux is not necessary in the refining step.

Pressure measurements on #5-D column indicated presence of an obstruction somewhere above the feed.

**Adipic Acid:** Preparation of operating manuals was continued.

**ZA-3 and ZA-4:**

R The HCN unit operated continuously until Friday morning when the line between the still and the scrubber plugged. Tube life has been about normal. However, the still has continued at about 60%. It is felt that the main difficulty is in the stripping still, which has not operated satisfactorily for some time. The new still is expected to arrive shortly.

The mild steel stirrer in the hydrolysis kettle failed last week-end. The new kettle was then piped up and operation has been satisfactory.

255 lbs. of refined methacrylic acid was distilled in the laboratory and has been polymerized in the plant equipment for warp size. The neutralization of the interpolymer is about complete. The drum dryer from the Experimental Station has been assembled to produce 400 lbs. dry warp size.

Two MK batches of normal propyl methacrylate are being started today.

Two days were spent at the Newburgh plant to investigate their complaints on the high viscosity of recent batches of 'Lucite' M-2.

One batch of methyl starch is in process.

9



THAYER

-2-

Formamide:

Materials balance is being run on the methyl formate and formamide synthesis to determine the chief sources of methanol losses. Methyl formate synthesis was operated three days to fill the refining storage and then shut down. The formamide synthesis is now being operated to exhaust this supply of methyl formate.

A back pressure recorder has been installed on the caustic still. This recorder shows that too much boil-up has been carried on this column previously. Operating procedure for this piece of equipment will be written to minimize the methanol loss, and speed up ammonia removal.

9/24/37.

6/6/50  
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Feb. 1942

6/6/50  
RR

The report and data attached to this sheet have been assembled from the effects of the late R. Briggs and are being submitted in that they may be of some value.

## Jacket for Silver Tubing of Urea Converter

6/6/50  
JLP

The blueprints which you received included one of type 3 converter. This converter has been replaced by a more efficient model, type 24. I am describing and illustrating the latter.

All measurements given below are approximate. The fundamentally important object is to have the jacket fit very tightly around the silver tubing. All measurements and dimensions are varied as much as is necessary to achieve a snug fit.

The jacket is 27 ft. long, and 23 inches in diameter. It is made thruout of specially constructed reinforced steel  $\frac{1}{2}$  inch thick. The name of the company making the steel might be obtainable. For nine inches from the bottom of the jacket up, and nine inches from the top down, the thickness of the jacket is increased to 1 inch. The extra  $\frac{1}{2}$  inch thickness is added on the outside.

Around the body of the jacket there are 68 holes drilled thru to the silver tubing, to permit hot water to get close to the silver tubing. These holes are

arranged in spiral fashion. Four holes circle the jacket in an ascending spiral opposite each of the 17 internal sections of the silver tubing.

The bottom of the jacket is double, and consists of three pieces. The first bottom, called a "head", is a piece of reinforced steel 23 inches in diameter. It is pushed up into the jacket to about 6 inches from the bottom, to fit snugly against the bottom of the silver tubing. This head has a rim about 1 inch wide, which is  $\frac{1}{2}$  inch thick. From the inside of the rim it slants downward toward the center. At the center it is 1 inch thick. It has 3 pipes,  $\frac{1}{2}$  inch thick and  $1\frac{1}{4}$  inch in diameter. These fit snugly around the silver tubing inlet lines.

The first head is held in place by a resilient steel ring  $\frac{1}{2}$  inch thick and one inch wide. The ring is 24 inches in diameter, but 1 inch is cut out completely. The cut ends of the ring are forced together, making a ring just 23 inches in diameter. This is inserted immediately under the first head, and allowed to spring out to its normal size. To permit this, the wall of

The jacket is rimmed out at the place<sup>3</sup> where the ring is inserted. The rimmed out place is  $\frac{1}{2}$  inch wide and  $\frac{1}{2}$  inch deep. The ring fits into the rimmed out space, and up against the first head.

Below this the second steel head fits. It is 23 inches in diameter and  $\frac{1}{2}$  inch wide. This head has three holes 2 $\frac{1}{4}$  inches in diameter to allow passage of the inlet pipes from the first head. It is connected to the first head by 10 one inch bolts, which are set in circular fashion inside the steel ring.

The top is made exactly like the bottom, except that, instead of 3 pipes, it has only one, to surround the outlet line in the silver tubing.

This jacket is set in a bulb. But improvements are being made in the bulb at the present time. When I can ascertain the construction of the new bulb, I will send the information.

If I could be informed of the lines along which the Institute of Fertilizers is working on Urea at Moscow, I might be able to make some pertinent suggestions.

Compare with pipe from steam jacket?

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PURIFICATION OF SYNTHETIC UREA

As the crude urea solution is delivered from the converter and cooling coils previously described, it consists (on the average) of 77% urea, 18% water and 5% unreacted gases and impurities; chiefly  $\text{N}_2\text{H}_4$ , as in the converter the  $\text{N}_2\text{H}_4$  is kept slightly in excess. This 77% solution is piped to a concentrator where the excess  $\text{N}_2\text{H}_4$  is driven off by heat, and recovered. The solution is then evaporated in a tier or column of steam-heated iron evaporating pans of ordinary design. The 77% solution enters at the top and gradually flows down from one pan to the next lower row, increasing in concentration as it descends.

When the concentration has reached 87% urea, the hot supersaturated solution is piped to the "wringer" or "centrifuge", which it enters at a temperature of  $55^\circ \text{C}$ . This centrifuge is also of ordinary design; the revolving bowl is made of stainless steel and operates at a speed of 3600 R.P.M. No bag or filter is used as the urea crystallizes immediately upon entering the bowl. The walls of the bowl are perforated with holes about  $1/4$  inch in diameter.

The centrifuge is operated by one man, and a single machine is sufficient for the total output of urea at plant B, at present. The bowl is about 4 feet in diameter and about 3 feet in height. The procedure of operation is as follows: The bowl is first brought up to speed, then the valve controlling the flow of the urea solution is opened; the hot concentrated solution

6/6/50  
215

(87% - 55° C) pours from a pipe onto the floor of the revolving bowl, in the center. The urea solidifies in snow-white crystals immediately upon striking the bowl.

When, in the judgment of the operator, the centrifuge has received a sufficient charge, the flow of solution is shut off, and the crystals are wrung dry, at 3600 R.P.M. They are washed once with a small amount of cold water. The centrifuge is then stopped, the bottom of the bowl is opened, and the crystals of urea are knocked loose from the sides of the bowl, whence they drop through a hopper into a drum for final drying. The process is then repeated, operating continuously.

The final drying of the crystals takes place in the usual rotary drum type drier, which also operates continuously. The "Crystal Urea" is packed in cloth bags of 100 lbs each, and is sold at present for \$5.00/100 lbs. The liquors and washings from the centrifuge are sold in solution form as crude or "liquid urea", used mostly for fertilizer.

Plant B at present operates three converters, two of which are of an old type, 10' in diameter, and one of the 23' X 24 foot type, as previously described. A second 23' converter is now under construction; also, a large addition to the purification and storage plant is being built.

The total output of Crystal Urea from this plant now averages 700 bags of 100 lbs. each, or 35 tons, per day. The present plans call for a greatly increased production in the near future. The whole process is still regarded as being in a semi-

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experimental state, and improvements in technique are now being developed to increase efficiency and output. For example, it has recently been found advantageous to subject all pipe lines conducting urea solutions to a treatment with Sodium Sulphide Solution ( $\text{Na}_2\text{S}$ ). This solution is pumped through the lines at times when normal production is suspended. The pipes are of course thus lined with a coating of metallic sulphides. Whether these act as a protective layer against corrosion or as a catalytic agent is not at present understood.

July 19, 1937



Manufacture of Synthetic Urea

6/6/50  
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Urea is made by combining one molecule of  $\text{CO}_2$  (carbon dioxide) with two molecules of  $\text{NH}_3$  (ammonia) gases, at high pressure, according to the following reaction:  $\text{CO}_2 + 2 \text{NH}_3 = \text{O}=\text{C}-\begin{matrix} \text{NH}_2 \\ \text{NH}_2 \end{matrix} + \text{H}_2\text{O}$

The following is a description of this process, in two parts:

I. Machinery and equipment used

II. Chemical process.

All pressures are in pounds per square inch; temperatures in degrees centigrade.

Part I - Machinery used.

Both the  $\text{CO}_2$  and  $\text{NH}_3$  are piped from general storage tanks to the compressors, in ordinary iron pipe,  $\frac{1}{2}$  inch inside diameter. The  $\text{CO}_2$  arrives at the compressors at 340 lb./square inch and is raised in 8 (eight) equal stages to 6500 lb./square inch. after the first stage it must be heated by steam to prevent solidification.

The  $\text{NH}_3$  arrives at the compressors at 28 lb./square inch and is raised by three stages to 5500-6500 lb. (These compressors are a special type and can be described separately in a later report.)

From the compressors the gases are piped to the autoclave or "converter" through reinforced iron pipe,  $\frac{1}{2}$  inch inside diameter, 1 inch outside. The  $\text{CO}_2$  line is steam jacketed and enters the converter at between 36° and 37°. The temperature must not fall below 36° or the gas will solidify. The  $\text{NH}_3$  enters the converter at 85° - 95°.

A third pipe carrying water enters the converter between the gas lines the purpose of which will be described in part II. This line has the same dimensions and characteristics as the gas lines. The water enters at 4800

lb./square inch or above, and at 86° or over.

6/6/50  
JLB

At a point three feet from the converter, on all three inlet lines, are stainless steel inlet control valves. The next point is of utmost importance: Beginning at these valves, all pipes, valves, joints, the converter, cooler, in fact all surfaces coming in contact with the urea, must be lined with pure silver, 1/8th to 1/16th inch thick. This silver must be 99.98% pure.

Many other metals and alloys have been tried, but none has been found which will resist corrosion as successfully as silver. All pipe couplings must be joined with silver washers, and the silver lining reamed over into the joint to make a perfectly continuous silver surface. All rivets, etc. used in constructing the converter "cartridge" must be silver. From the point of the inlet control valves to the end of the cooler the urea touches no other metal.

#### Construction of the Converter

The converter is essentially a vertical cylinder, 23 inches in inside diameter and 24 feet long. The gases are introduced at the bottom and the molten urea flows out at the top into the cooler coils. The whole converter consists of four concentric tubes which will be described separately, beginning with the innermost. The inside tube is the silver lining or "cartridge" shown in drawing no.1. It is made of 1/8 inch silver sheet throughout. The tube is divided by 27 baffle plates, spaced equally throughout its length, at 17 7/8 inches. (See also drawing no.2.) These plates are perforated by holes, alternately at the center and at the edge of the plates, to insure thorough mixing of the liquid as it passes up the tube.

The three lines carrying the CO<sub>2</sub>, NH<sub>3</sub> and water, enter the bottom of

6/6/50  
AK

the cartridge through pipes of equal size. There are two methods of mixing the gases as they enter, which can be interchanged. First, the pipes are simply bent at right angles, the openings facing the wall of the converter. Second, the "Sparger coil" is sometimes used - drawing no. 3. This causes the gases to mix with a swirling motion around the circumference of the converter. The second method gives a more uniform product, but the quality is not as good as the best produced by the first method. (This problem is now being worked out, and may be the subject of a special report later.)

The second "layer" of the converter is the "jacket", see drawing no. 4, a tube of specially constructed reinforced steel,  $\frac{1}{2}$  inch thick. The jacket is 23 inches in diameter inside, and 27 feet long overall. The silver cartridge is lowered into the jacket by a crane. It is of the utmost importance that a close fit be obtained all around. For 9 inches at each end, the jacket is 1 inch thick instead of  $\frac{1}{2}$  inch.

Equally spaced around the jacket are 68 holes,  $\frac{1}{2}$  inch in diameter, i. e. four holes for each of the 17 sections in the silver cartridge. These holes are arranged in a spiral throughout that part of the length of the jacket which comes in contact with the walls of the converter cartridge. These holes have three purposes: 1, to allow more heat to escape from the silver cartridge; 2, thermocouples are placed in these holes at intervals to control temperature of the reaction; 3, they act as safety valves in case of a leak in the cartridge, being the weakest points in the jacket. The jacket is surrounded by high pressure water, 4800 lb. or over. If urea were to leak through the jacket it would quickly be corroded. The water surrounding the jacket is tested for the presence of urea every half hour, so leaks can be detected before much damage is done.

The bottom of the jacket is double, and consists of three pieces:

6/6/50  
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first the "head", reinforced steel, 23 inches in diameter, is pushed up about 6 inches from the bottom, to fit snugly against the bottom of the silver cartridge, being shaped exactly the same as the end of the cartridge (See drawings 1 and 2) This head is held in place by a ring of spring steel,  $\frac{1}{2}$  inch thick and 1 inch wide, 24 inches in diameter. This ring is cut so that it can be sprung together, fitted in a groove which is reamed out of the jacket, and expanded into position. The second head is then placed snug against the ring and bolted into place with 10 bolts.

In the first head there are three equally spaced holes  $1\frac{1}{2}$  inches in diameter to admit the three inlet pipes. In the second, the holes are  $2\frac{1}{2}$  inches, allowing for packing on the inlet pipes.

The top heads are attached in exactly the same manner, except that only one hole occurs,  $1\frac{1}{2}$  inches in diameter, which conducts the area to the cooler. Next outside the jacket is the "bulb" a heavy shell of cast iron (see drawing 5) There is a one inch space between jacket and bulb, which is maintained at 4800 lb. water pressure. To prevent the jacket from bursting. This water enters at room temperature and serves to cool the jacket if the temperature rises beyond  $86^{\circ}$ . The bulb is made of cast iron, 5 inches thick around the body. It is 30 feet long, and 26 inches in diameter inside. For 3 inches from the bottom up, and 3 inches from the top down, it is 7 inches thick, the additional 2 inches being on the outside. These 2 by 3 inch extensions are notched to hold the packing flange. For 18 inches from the top down, a standard 1 inch thread is cut into the inside wall.

The top consists of 2 heads. The lower head is 26 inches in diameter and 7 inches thick. It is set inside the bulb 25 inches down from the top, and extends up from there to the bottom of the thread cut. It must fit the

walls of the bulb perfectly, so that no water can leak through. Therefore it is white leaded around the edges touching the wall. From  $\frac{1}{2}$  inch in from the outer edge, to  $1\frac{1}{2}$  inch in, 6 extension notches are machined on. The notches are 1 inch high by 1 inch wide by 2 inches long. They fit into similar notches cut into the top of jacket wall.

Machined onto the lower side of this head is a piece 23 inches in diameter and  $4\frac{1}{2}$  inches thick, making the entire lower head  $11\frac{1}{2}$  inches thick, through the 23 inch center. This part fits down against the upper head of the jacket. Through the center of the entire lower head there is a hole 6 inches in diameter, to allow passage of the outlet lines and the high pressure packing around it.

The upper head of the top is 18 inches thick. It is 28 inches in diameter, with a standard 1 inch thread cut into the outside edge. This head screws into the top of the bulb. This head also has the 6 inch hole for the outlet pipe.

The bottom is closed by a single head 40 inches in diameter and 5 inches thick, which fits up against the bulb bottom. It is held in place by a high pressure gasket. In a diameter of 31 inches from the center, there are 34 holes  $1\frac{1}{2}$  inches in diameter. Into these holes, 12 inch studs are inserted. They go up into the wall of the bulb about  $2\frac{1}{2}$  inches from the inside. All studs and gaskets are white leaded.

Machined to this part there is a piece which is identical with the lower head of the top. The only difference is that through the entire bottom head, there are 3 five inch holes, to allow passage of the inlet pipes and packing, instead of the single outlet pipe hole on top.

Temperatures are taken through small holes drilled through to the silver tubing next to the inlet and outlet lines. In these holes are the thermometers, supported by high pressure plugs.

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~~Around the bulb is the steam jacket, which is coated on the outside by asbestos. This jacket is 2 inches from the main body of the bulb, but touches the top and bottom flange extension necks.~~

Finally, outside the bulb, after a 2 inch space, is a steam or water jacket, of  $1\frac{1}{2}$  inch steel, capable of carrying 450 lb. pressure. This outside jacket is surrounded with asbestos insulation, making the whole converter unit 5 or 6 feet in diameter. See drawing 67 - cross section of the entire converter assembly.

From the converter the hot molten urea mixture is piped directly to the cooler in steel tubing,  $1\frac{1}{2}$  inches inside,  $5/16$  to  $3/8$  inches thick, and lined with  $1/8$  inch silver. The cooling is done with running water, the pipe being water-jacketed. The cooling unit consists in all of about 1,184 feet of pipe as described, all of which is water-jacketed except about 80 feet, as follows: There are 27 "inch coils," or sections, each 18 to 30 feet long, consisting each of two lengths of straight pipe, and connected at the ends with semicircular bends about three feet in length. The straight lengths are water-jacketed, the method of connection being shown in drawing 7. Making in all 46 lengths of 18 feet and 46 bends of 3 feet each. These bend pieces are lined with silver by driving silver tubing into straight pieces of pipe and then heating and bending the whole. The cooling water enters groups of these 27 coils as follows, to permit gradual cooling: the top three coils are cooled by one separate stream which enters at room temperature and comes out at nearly  $86^{\circ}$ . The next 24 coils are cooled in six separate groups of 4 each - so that the rate of cooling can be graduated from top to bottom, the water entering cold at the bottom of each group and emerging warm at the top.

At the bottom of the cooler the urea emerges into ordinary stainless steel pipe of  $1\frac{1}{2}$  inch inside diameter and  $1/8$  to  $\frac{1}{4}$  inch thick, at about 20 lb. in pressure, whence it is pumped to the storage and purifiers. Then

Part II - Chemical process ○

6/6/52

The two gases -  $\text{CO}_2$  and  $\text{NH}_3$  must be of a high grade of purity. The  $\text{CO}_2$  is made from "producer gas", i.e. coke - and the ammonia is synthetic, made by the iron oxide catalytic process.

As before described - the  $\text{CO}_2$  enters the converter at a pressure of 4500 lb./ square inch and between  $86^\circ$  and  $87^\circ$  in temperature. The  $\text{NH}_3$  enters at 4500 to 4600 lb./ square inch and at  $85^\circ$ -  $95^\circ$ . The reaction seems to be instantaneous at these pressures and temperatures; it is estimated that the urea is already liquid at about the third section up from the bottom of the converter. The method, or time of mixing of the gases seems to have an important effect on the quality of the urea product. This point is now being studied.

The reaction proceeds most efficiently at  $86^\circ$  Centigrade. At the start it is customary to introduce warm water between the jacket and the bulb (at 4800 lbs.) until the desired temperature is reached. The reaction then becomes exothermal, and it is necessary to circulate cool water in this space to prevent the temperature rising. Should the converter be shut off for any reason, steam at 450 lbs. is circulated in this space to maintain  $86^\circ$  until production is resumed.

The most important point in the technique of operating the converter is to raise and lower the pressures inside and outside the jacket at an equal rate. This is very difficult as no means of automatic control has yet been devised, and silver cartridges are frequently ruptured inward or outward by sudden inequalities in pressure. A spare cartridge is always kept in readiness, and when this occurs an emergency or shock crew of men is rushed to replace the cartridge and resume production in as short a time as possible.

Part II - 2

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The pressure and temperature of the gases at the inlet also has an important effect, and it is attempted to keep these factors as uniform as possible, which however is very difficult. It is probable that by better control of inlet pressures, and an improved mixing method, a much shorter converter could be used. This problem again is the subject of current experiments.

Temperature control in the converter is very difficult, as thermocouples cannot be introduced, due to corrosion difficulties. Approximate temperatures are obtained by placing thermocouples against the silver cartridge through the holes in the jacket previously described. Silver thermocouples, welded in place are now being used.

The highest grade of urea  $\text{N}$  produced is about 76-77%, allowing for the one molecule of water produced in the reaction. This grade is used in the manufacture of synthetic plastics and elsewhere. Lower grades are used for fertilizer, etc.

The water line entering the converter (mentioned in part I) is used for three purposes: 1. At times a product called "liquid urea" is produced which is shipped in tank cars unpurified - this is a 37-40% solution of grade urea. This product is made by introducing the required amount of hot water through this third line, care being necessary that the temperature does not drop in the process below 36.<sup>o</sup> 2. If the machine should become clogged by solidified urea at any point, the inlet valves must be closed immediately; the whole process stopped. The converter is then flushed out with steam or hot water by means of the water line. Everything must be thoroughly flushed out before the process can be restarted, a very expensive proceeding. Every effort is made to keep the converter running continuously. 3. As the process continues, a scale of hard, greenish material of unknown composition accumulates on the lining of the cartridge, probably due to



Part II - 3

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impurities in the gases. Every eight hours, water is introduced, which dissolves off this scale.

The whole process here described, while at present is a very valuable and productive system, is undergoing constant improvement and experiment, in such lines as design of apparatus, method of mixing the gases, presence of impurities, pressures and temperatures, with the idea of improving quality and quantity of output. Converters of four times the present capacity are now in process of design.

The output of finished product of the converter here described, i.e. the 23 inch, 24 foot model inlet tubes:

$\text{CO}_2$  -  $\frac{1}{2}$  inch - 6500 lb. - 25-57° -  $\text{NH}_3$   $\frac{1}{2}$  inch - 5500-6500 lb. - 25-95° is normally 15,475 lbs. of 77% urea per hour, consuming 8,375 lbs. of  $\text{NH}_3$  and 5,100 lbs. of  $\text{CO}_2$  per hour. The recrystallised urea is sold at present for \$5.00 a hundred pounds (about 45 kg)

6/10/37

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PROCESS SECTION

WEEKLY PROGRESS REPORT

WEEK ENDING DECEMBER 17, 1937.

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Report on the progress of the work done during the last week.

The work done during the last week has been devoted to the manufacture of a scrubber for the use of the gas absorber. The scrubber is a vertical column with a series of trays. The gas enters at the bottom and the liquid enters at the top. The gas and liquid flow in opposite directions. The scrubber is designed to remove the gas from the liquid.

Manufacture of scrubber

Results of tests

Conclusions

The results of the tests on the scrubber during the last half of the week varied between 4 and 5 percent of saturation. The scrubbing efficiency was improved during the week and redesigned to prevent the coupling of water with the gas sample.

A packed column was designed to be used as a stripper in determining the amount of organic sulfur remaining in the scrubber water after the scrubbing process.

Design of stripper

The preliminary flow sheet on Propionic Acid synthesis received this week has been examined and criticized in conjunction with the Engineering and Operating Section representatives.

12/17/50

4/13/37

Plant Superintendent Forde

Crystal Urea Plant Operation  
Cause of Crystals of Ammonium Sulfate in Crystal Urea.

Let 111- 1000

Summary of Findings

The fourth series of corrosion tests to determine the effect of copper on mild steel Urea absorber equipment have been completed. In this test the crystal concentration was increased from 10 to 20 p.p.m. The observation of the specimens indicate no appreciable copper plating. Further tests of the several specimens and analyses of the liquor will be reported next week. Under present operating conditions of a hydrogen sulfide free carbon dioxide the Urea-I effluent from the No. 1 still shows negligible corrosion. On the other hand the large No. 2 still, which runs in place in Urea service, should this large still show evidence of corrosion it may be necessary to consider the advisability of adding small, 2 to 3 p.p.m. of copper to the feed.

Copper inhibitor in No. 1 absorber solution was reduced from 30 to 20 p.p.m. with entirely satisfactory results. It is significant that no corrosion leaks have developed in this still since it was placed on Crystal production about three weeks ago. This compares with three shut downs to repair calandria leaks in a similar period when the still was producing Urea. The H<sub>2</sub>O<sub>2</sub> test of the No. 2 evaporator effluent rose from 12 to 15 minutes following the reduction in inhibitor concentration.

The operation of the No. 2 still has been none too satisfactory as evidenced by apparent plugging of the vapor line to an annoying but to a less extent than before the new feed sparger was installed. A thorough inspection of this unit will be made when the No. 3 still has been put into operation on Crystal Urea. Unless the No. 2 still feed sparger is found to be plugged it is probably that further modifications to the feed and reflux spargers will be necessary to ensure satisfactory operation.

A study of operating conditions during the year has been made with respect to the evaporator system. There is every evidence that the excessive steam pressure required at present in the No. 2 evaporator calandria—125 pounds as against a normal 40 to 60 pounds—is due to fouling of the heat transfer surface. An inspection of the calandria will be made at the first opportunity.

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Agents: Gray, Gordon, Putnam, Smiley, Williams.

Old Work    Trolley Operation  
              Generator Operation  
              Coke-Oven Gas Purification  
              Coke-Oven Gas Liquefaction  
              Chlorination of Cooling Water  
              Fuel Gas Control  
              Disposal of Acid Sludge from Light Oils Refining

New Work    Coal Mixing  
              Sulfur Paste Handling

Results of Interest

Fuel Gas Control

Protection of the dilution gas line from freezing was completed and automatic control resumed with good results. During a 4-day observation period with an ample supply of dilution gas the variation in heating value exceeded  $\pm 2\frac{1}{2}\%$  of the average for less than 2% of the time. A recommendation was prepared covering the required extension of the spillage line to make the gas pass through the spillage holder. This should assist in avoiding sudden variations in the heating value of the oven fuel gas.

Generator House

Results of the carbon balance were better than was anticipated but showed a wide variation in fuel bed conditions. Further work in this line will be deferred until a study of set operation is made. A progress letter showing results is in preparation.

Plans for a simplified steam decomposition meter were completed and the necessary parts ordered.

Algas Control

No. 3 absorption refrigeration unit was shut down for an indefinite period. Due to the prospect of single unit operation during the winter and the difficulty of following the frequent unit changes, attempts to chlorinate the cooling water were stopped.

Disposal of Acid Sludge

Work on the neutralization of the sludge with waste lime was continued.

Coal Mixing

A recommendation was made for the installation of simple equipment to permit mixing of the two types of coal. This should give a generator fuel of more consistent characteristics than the present method of alternating barges of the two types.

12/17/37.

6/15/37

Research - Briggs, Goldbeck, Hurt, Stiles, Sirril

Old Work Nitriles and Amine Manufacture  
Laboratory Studies of Coconut Oil Refining  
Laboratory Study of Fatty Acids Hydrogenation.

New Work Hydrogenation of Benzene to Cyclohexane.

Summary of Interests

Nitriles

The nitrile unit was not used this week. Adipic acid flask vaporizer is being installed in preparation for a run next Monday.

A distillation of 200 gallons of crude D-75 is currently in progress.

D-310 Distillation No. 32 was completed this week yielding 610 pounds of refined D-310 plus 118 pounds of intermediates boiling slightly below D-310 and 86 pounds of tailings boiling slightly above D-310. These latter two fractions will be redistilled to recover the additional D-310.

Benzene Hydrogenation

Five Custom Unit runs were made in which Sensolvoler thiophene-free benzene was successfully hydrogenated to cyclohexane. Starting with 2% fresh LOR catalyst in the first run the amount of fresh catalyst added in the 5th run has been cut down to 1%. This grade of benzene hydrogenates as easily as phenol with a very low catalyst consumption. The only difficulty encountered was excessive carryover of liquid in the exit gas to the separator. 250 gallons of Belle thiophene-free benzene is now being hydrogenated.

Nickel Catalyst Reducer

The new vertical nickel catalyst reducer is being used successfully in the catalyst plant. Activity of the reduced catalyst is up to standard. Yield has been improved slightly over that obtained from the old style reducer and further changes are being made which are expected to raise yields. The benefits of this new design are greater safety of operation, greater convenience in handling, time saved in charging and discharging, improved activity and yield.

12/12/37

6/4/50

James McConnell, James Hamilton, James Lewis, Shuffie, Roy.

Old Work Alcohol Refining General.  
Formamide, 2A-3 and 2A-4.  
Isobutyl Propionate  
Cyclohexanone and Adipic Acid.  
Isobutyl Acetate.  
Dimethyl Sulfate Manufacture.

New Work None

Results of Interest

Alcohol Refining

The higher alcohol still train has been down two days this week for testing calorimeter. Several leaks were found in No. 3-2 calorimeter.

Flow sheets and arrangement drawings for the new still house were reviewed with the Engineering Section, Operating Section, and Design Division.

Formamide

Although the acidity of the crude dimethyl sulphate continues to be high, satisfactory refined dimethyl sulphate is produced on distillation.

Isobutyl Propionate

The manufacture of propyl acetate is being continued.

Isobutyl Acetate

Flow sheets and arrangement drawings for the proposed isobutyl acetate plant were reviewed with the Engineering Section and Design Division.

Adipic Acid

A large number of leaks were found in the tube bundles for the liquid phase oxidizers. The individual tubes are now being tested so that the defective tubes can be blanked off.

Formamide

An investigation has been started to determine the cause of plugs in the HI-OD line and the methyl formate tubes. A sample, which appears to be an emulsion of oil and water, was collected over a 16-hour period from the HI-OD sample line at the formamide plant. The material has a freezing point of approximately 0°C. A complete analysis of this material is under way.

6/6/50  
JFK

MAN SICKMAN, JILL, LeMaster, Smith, Stiles.

Old Work Alcohol Synthesis.  
Alcohol and Contact Catalyst.  
Contact Conversion,  
Ammonia Synthesis.  
Purifier Performance.  
Low Pressure Purifier Tests.

New Work None.

Results of Interest

Alcohol Synthesis:

12/16: Average production of current alcohol runs to 8:00 A.M.,

UNIT	AREA	CATALYST	Wet Grude Lbs./Hr.	% TA	Gal./Hr. 100%	% Y
C-3	689 (Ends 12/12)	ME	4670	87.6	582	10.3
	54 (Started 12/13)	ME	4614	88.6	584	10.4
C-4	625	ME	5221	87.3	647	11.0
C-5	547	ME	5609	87.6	699	10.7
C-7	435	ME	5550	96.2	813	8.0
C-8	152 (started 12/9)	ME	5079	87.2	629	11.4
C-9	310	ME	5120	88.2	644	9.9
C-10	457	ME	4815	87.6	600	10.3
A-10	952	ME	5640	96.5	808	8.8

The reaction was lost on C-3 on 12/11, and after its subsequent light-off the production was apparently limited by low catalyst activity. The catalyst was changed on 12/12, and upon examination of the discharged pills some were found to have been overheated as shown by their gray-green color.

Production on A-10 is being limited by methanation.

Contact Conversion:

Catalyst was changed in A-5 converter, throughput having averaged 31 T NH<sub>3</sub>/day and 1 ton NH<sub>3</sub> per 4.8 lb. fresh catalyst in the charge. Approximately three trays of the discharged catalyst which were to have been recharged were ruined by overheating during oxidation. Subsequent reduction was carried out smoothly without direct Process supervision.

Oxidation and reduction are handicapped in A-Plant by non-suitability of the blower, which has been in use several months



6/6/50  
20

The production of coded bases was completed last week and the amount of stock produced was 2000 which averaged 4000 lbs. per ton. The equipment held-up to 5000 lbs. of load and a 20% yield was obtained on the hydrolysis step. The yield and dried state combined.

Tests of the loss of the drying

Additional tests have been conducted on the electrically heated nozzle of the vaporizer plugged almost 100% with material. The nozzle was cleaned and the material was removed. The nozzle was tested and the formation of the material was observed. The nozzle was tested and the formation of the material was observed. The nozzle was tested and the formation of the material was observed. The nozzle was tested and the formation of the material was observed. The nozzle was tested and the formation of the material was observed.

Additional tests on the hydrolysis step in the laboratory were completed.

10/17/50

6/6/50  
20

Veil

- 2 -

pending repairing of the G E blower. The substitute blower has been shut down frequently during use in order to change oil, its gas handling capacity is low and variable, and the gas delivered by it has a 'burnt oil' odor.

B-1 converter has been recharged and reduced and is being held at low pressure in an atmosphere of converted gas until needed when B-1 unit goes onto blow-run service.

Organic sulfur concentrations (Gr. S/100 G.F.) at the exit of the preliminary water scrubbers are tabulated below:

Date	A-3 (Twyne)		B-2 (Wt. plates)		B-8 (Wt. plates)	
	Gr. S	GAL./CF	Gr. S	GAL./CF	Gr. S	GAL./CF
12/13	0.54	0.35	1.37	0.45	-	-
14	0.48	0.37	1.25	0.45	0.45	0.35
15	0.61	0.37	1.35	0.45	0.35	0.35
16	0.27	0.37	1.00	0.45	0.47	0.37

The poor performance of B-8 relative to A-3 has been verified by exchanging the analyzers. The good performance of B-8 is now being checked by an additional analyzer.

Purifier Performance

When the cartridge removed last week after 356 hours was tested it showed no leaks. It was recharged and placed in A-8 No. 2 where it is giving satisfactory performance at the present time.

Three charges of purifier tubes were made during the week aged 180, 445 and 485 hours. No leaks were found in the one removed after 180 hours. The catalyst appeared to be in good condition. No reason for the high leakage shown by this tube can be given. When put in service again it showed normal operating characteristics. The cartridge removed after 445 hours had leaks in the heat exchange coils. These coils were 720 hours old and are to be replaced. Leaks were found in the skirt weld of the cartridge removed after 485 hours. The coils appeared to be in good condition.

A better way of comparing purifier tubes is by the amount of gas that they have purified. Hereafter the approximate equivalent tons of ammonia will be given for each charge. For the three charges made this week, aged 180, 445, and 485 hours, the tons of ammonia throughput were 394, 508 and 668 tons, respectively.

4/6/50  
gds

ANALYSIS SYNOPSIS

Production on A-9 has averaged slightly over 175 T/D for the past week. Control of make-up gas composition is very erratic at times thus causing fluctuations in production.

12/17/37.

Physical Test

Expt. No.	Formula	Tensile		Elongation		Average Thick.		Avg. Fold		Tear		Fallen Test
		Al. Ac.	Al. Ac.	Al. Ac.	Al. Ac.	Al. Ac.	Al. Ac.	Al. Ac.	Al. Ac.	Al. Ac.		
ALN-1666	Scrap from proposed processing method, EMS Rem. Jet. estimated 0.188 gm. Gelva/100 gms. scrap, plate coated in laboratory.	18.8	20.1	36.7	38.7	.0047	.0048	20	19	568	608	175
EMS Lab CHECK #182-B	EMS dope made in lab. Plate coated in lab.	18.8	18.8	40.7	41.2	.0048	.0048	24	20	528	648	100
#182-C	EMS dope from reg. dope system. Plate coated in lab.	17.9	18.8	34.2	40.8	.0049	.0047	48	37	408	528	105
#182-D	Film coated from EMS dope on regular coating machine.	18.8	18.8	42.0	45.2	.0056	.0056	20	19	568	668	150
ALN-1667	New EMS dope containing 0.024 gm. Gelva/300 gms. dope, 2X normal scrap content. Plate coated in lab.	21.7	21.8	38.7	44.0	.0052	.0052	24	22	20	24	168
ALN-1668	New EMS dope containing 0.048 gm. Gelva/300 gms. dope, 6X normal scrap content, plate coated in lab.	21.0	20.8	40.2	44.2	.0055	.0055	20	25	44	54	220

7/9

No.	Formula	Physical Test										
		Tensile		Elongation		Average Thick.		Avg. Folds		Tear	Mullen Test	
		Al. Ag.	Al. Ag.	Al. Ag.	Al. Ag.	Al. Ag.	Al. Ag.	Al. Ag.				
1699	New EMS dope containing 0.096 gm. Gelva/500 gms. dope 12X normal scrap content. Plate coated in lab.	22.6	20.8	42.8	39.2	.0062	.0061	24	23	54	68	202
1700	New EMS dope containing 1.92 gm. Gelva/500 gms. dope 24X normal scrap content. Plate coated in lab. (This sample showed some trouble in stripping from the plate)	19.1	21.0	37.0	41.7	.0084	.0087	28	45	54	52	215
1701	Regular new EMS dope contains no Gelva. Plate coated in lab. (CHECK)	23.7	23.8	47.9	44.8	.0060	.0060	21	18	76	76	210

ack:EK

42

*Handwritten signature*

Problem 551-E-1

11/6/50  
27

ROLL COATING DEVELOPMENT DIVISION  
KODAK PARK

November 7, 1950

Mr. E. Stadler,  
Building 19:

Subject: M-7-E Bleachable Cine Negative  
experiments on S6 machines.

This is to arrange for the use of  
S6 machine today at approximately 1 o'clock  
to run experiments on M-7 Bleachable Cine  
Negative. M-5 support is to be used as  
stock which you will provide. No help is  
needed.

Account - EWO 2363

Clark Smith/RE  
cc-Dr. Madson (2)  
Mr. Fox  
Mr. Clark J. Smith

Gale F. Madson

*Gale F. Madson*

#5 is good application, low curl.

for 86 mach.

10 g / min

6/6 50  
7/10

orig. 720

Case: V. 1 V. 2

N-17622 cl	4% E-53209	3% #102	Del 9161	61
N-17623 cl	"	4% "	"	53
N-17624 cl	"	5% "	"	51
N-17625 cl	"	6% "	"	39
N-17626 cl	"	7% "	"	45
N-17627 cl	"	8% "	"	43
N-17628 cl	"	9% "	"	44
N-17629 cl	"	10% "	"	43

run on N5-

Solvent added to	1.	120 gram	35% ac
	2.	85 "	34% ac
	3.	65 "	33% ac
	4.	65 "	32% ac
	5.	50 gram	33% ac
	6.	60 gram	33% ac
	7.	60 "	34% ac

**ROLL COATING DEVELOPMENT DIVISION  
KODAK PARK**

November 17, 1941

Mr. E. Stadler:  
Building #19

Subject: Experimental E-7 Bleachable Cine Negative--  
Additional low curl U-coats and new dye sol-  
vent.

Please arrange to produce 20-foot samples  
as per subject on #89 machine observing the follow-  
ing:

Stock: E-7 Cine unscrubbed  
Speed: 10 feet per minute  
Threadsp: #23, drawing from the top.  
Air section inlet temperatures:  
1 and 2 - 180°F  
3 and 4 - 180°F  
5 and 6 - 220°F

Apply:

	6th SS 70°H.J. N-17760	7th SS 70°H.J. CAC	6th SS 65°H.J. N-17687	6th SS 75°H.J. CAC
•	•	•	07	•
•	•	•	08	•
•	•	•	09	•
•	•	•	10	•
•	•	•	11	•
•	•	•	12	•
•	•	•	13	•
•	•	•	14	•
•	•	•	15	•
•	•	•	16	•
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•	•	•	94	•
•	•	•	95	•
•	•	•	96	•
•	•	•	97	•
•	•	•	98	•
•	•	•	99	•
•	•	•	100	•

Take 8-foot appearance tests from finish  
of each sample for Clark J. Smith, building #13.  
Discard balances.

Acct. KVO 2363  
ClarkSmith/MUL  
cc: Dr. Madson  
Dr. White  
Mr. Fox  
Mr. Pillier  
Mr. C/Smith  
#89 Machine

Gale F. Madson



11/17/41

6/6/50  
219

John - for XL -

← N-17696 1% AG  
1% BT  
1% Anosol Ag  
in 100% #12

plus 1cc #73 / 600cc #12

- ← N-17697
- ← N-17698
- ← N-17699
- ← N-17700
- ← N-17701
- ← N-17702
- N-17703
- N-17704

"  
"  
"  
"  
"  
"  
"  
"

- plus 1cc #73 / 550 cc #12
- " 1cc #73 / 500 cc #12
- " 1cc #73 / 450 cc #12
- " / 400
- " / 350
- " / 300
- " / 250
- " / 200



for bleachable Neg.

Chemical No. 73 = 25% Ammonium Hydroxide.

6/4/50  
90

ROLL COATING DEVELOPMENT DIVISION  
KODAK PARK

November 4, 1941

Mr. E. Studier:  
Building #19

Subject: Experimental E-7 Bleachable Cine Negative--Tests on  
New Batches of GAP -- E-53209 and E-53127

Please arrange to produce 20-foot samples as per sub-  
ject on 89 machine observing the following: Stock - E-7 Cine,  
unsubbed; Speed - 10 feet per minute; Threadup #23, drawing from  
the top; Air section inlet temperatures: 1 and 2 - 180°F, 3 and  
4 - 200°F, 5 and 6 - 210°F. Apply:

	8th GS 75°H.J. E-17583	7th SS 75°H.J. EAC	6th GS 65°H.J. E-16128	5th SS 75°H.J. EAC	3rd GS 75°H.J. 125° Drum E-16988
1.					
2. (ok)	E-16908				
3.					E-17570
4.					71
5.					72
6.					73
7.					74
8.					75
9. 31m cover					76
10. E-17584					E-16988
11. 31m cover					
12. 31m 50-50 GS					
13. 37m 100-87					
14. 37m 100-168					
15. 37m 100-169					

Recorded *gjs.*

Change temperature conditions as follows: 1 and 2  
air sections to 160°F; Drum at 3rd place to 80°F. Apply:

	8th E-16908	7th EAC	6th E-16128	5th EAC	3rd E-16988
16.					
17.					

Asst. EVO 2363  
Clark Smith/MML  
cc: Dr. Madrau, Mr. Fillier  
Dr. White Mr. GJ Smith  
Mr. Fox #89 Machine  
Mr. Indlekofer 11/4/41

Gale F. Madrau

John -

C

O

L/6/50  
vis A

17563	✓	5% CAP	E-59209	45% #2, 20% #102	Bal #89	
64	✓	"	E-53127A	"	"	
65	✓	"	E-53127B	"	"	
66	✓	"	E-53127C	"	"	
67	✓	"	E-53127D	"	"	mistake - 87
68	✓	"	E-53127E	"	"	
69	✓	"	E-53127F	"	"	
70	✓	1 1/2% CAP	E-59209	Bal Eth Acetate		vis B
71	✓	"	E-53127A	"	"	
72	✓	"	B	"	"	
73	✓	"	C	"	"	
74	✓	"	D	"	"	
75	✓	"	E	"	"	
17576		"	F	"	"	

1 gallon of each.  
Take discontinues

Dr. White has these cottons.

1500  
1500  
1500

XL 2482  
Prob. 204-1

4/6/50  
20

ROLL COATING DEVELOPMENT DIVISION  
KODAK PARK

October 29, 1941

Mr. E. Studier:  
Building #19

Subject: Experimental E-7 Bleachable Cine Negative--  
Attempts to reduce support Curl and a new  
resin overcoat.

Please arrange to produce 20-foot samples  
as per subject on #9 machine, observing the follow-  
ing: E-7 Cine unsubbed support as stock; a speed of  
10 feet per minute; threadup #23, drawing from the  
top; inlet air section temperatures 1 and 2 - 180°F,  
3 and 4 - 200°F, 5 and 6 - 210°F. Apply:

	6th CS 75°H.J.	7th CS 75°H.J.	6th CS 65°H.J.	5th CS 75°H.J.	3rd CS 75°H.J. 125°Drun
1.	E-18008	SAC		SAC	
2.	.	.	E-16128	.	
3.	.	.	.	.	E-18008
4.	.	.	.	.	E-17489-CL
5.	E-17489-CL	.	.	.	.
6.	.	.	.	.	E-18008
7.	.	.	.	.	
8.	.	.		.	

Take 8-foot appearance tests from finish  
of each sample for G. J. Smith, building 13. Dia-  
card balances.

Asst. EVO 2363  
ClarkSmith/KOL  
cc: Dr. Madean  
Dr. White  
Mr. Fox  
Mr. Indlekofer  
Mr. Fillier  
Mr. CJSmith  
#89 Machine

Gale F. Madean

John -

XL-2482

Bleachable -

N-17488CL

3% E-52995

2% #102

95% #91

N-17489CL

5% Alvar 30-50

in 15% #95

85% Isopropyl

These are made up - ready to filter  
to be run Wed AM.

4/2/50

12-30-41  
M. Ct. N-17957  
5/27 ES3209-507 7507 #12  
dyl N-18262 13AL-0.13 BP 170mkt  
75/25 - 12-87  
Tct N-17806 125-ES3400 207-63  
80% Butyl Acetate  
N-75 gram ES401 150cc #3  
150cc Butyl Ace

N-17951

5 1/2 E 53209

508-#7

509-#12

---

N-17930

0.758 AG dyl

0.6 BR dyl

18 Anvol AY

75-#12-25-87

---

N-17806

1.25? E 53400

20963

80?-Ritz's Antlers

C

O

1/2 E 33204

175 AC

4 BA

17 Annual AY

100 #12

Cell Postal Butyrak

Photostat Type AB 3810

E 33204



1/12/42

6/6/50

N-18355	2%	N-5 support in	95/5	←	#12/#7
N-18356 cl	5%	E-53209 (CAN)	40/60	←	#91/#1
N-18357 cl	5%	"	50/50	✓	"
N-18358 cl	5%	"	60/40	✓	"
N-18359 cl	5%	"	70/30	✓	"
N-18360 cl	5%	"	80/20	✓	#91/#7
N-18361 cl	5%	"	70/30	✓	"
N-18362 cl	5%	"	60/40	✓	"
N-18363 cl	5%	"	50/50	✓	"
N-18364	3%	"	100%	✓	#7
N-18365	4%	"	"	✓	"
N-18366	5%	"	"	✓	"
N-18367	6%	"	"	✓	"
N-18368	5%	"	50/50	✓	#7/#12
N-18369	5%	"	45/55	✓	"
N-18370	5%	"	40/60	✓	"
N-18371	5%	"	30/70	✓	"
N-18372	5%	"	30/70	✓	"

Experimental only

get small amount of E-53144A from colodent for AP Stack.

4/6/52  
JW

N-18355 - 2% NS support in 95/5 - 12-7

N-18356	58 E	53209	CAP	40/60	91-12
57	"	"	"	50/50	" "
58	"	"	"	60/40	" "
59	"	"	"	70/30	" "
60	50%	53309	CAP	80/20	91-7
61	"	"	"	70/30	" "
62	"	"	"	60/40	" "
63	"	"	"	50/50	" "
64	3%	"	"	100%	" 7
65	4	"	"	"	" "
66	5	"	"	"	" "
67	6	"	"	"	" "
68	5%	"	"	50/50	7-12
69	"	"	"	45/55	" "
70	"	"	"	40/60	" "
71	"	"	"	35/65	" "
72	"	"	"	30/70	" "

List of Cellulose Esters

	Type	Hydrolysis	P. V.	Acetyl	Propionyl	Butyryl	ADD. AC.
E1863B	4x AP						
E1863D	16% PR		94.3%				
E2072D	4x AP		87.8	40.1			
E2072E	16% PR		86.9	39.4			
E22793	AP 4%	No analysis					
E22956	AP 4%	No analysis					
E11773-4-5-6	AP2500						
E23351B	4x acetate		54%	37.8			
E23370A	33% AP	1 1/2 hours		13.0	34.9		
E233700		3 days		11.8	32.0		
E23490	33% AP	Insolubility in ethyl acetate		8.0	32.9		
E23495	Tributyrate						36.0
E23501D	16% AP	100 hours		33.1	14.9		
E23506A	High N	1 1/2 hours	97.5	14.3		38.1	
E235060	AP	3 days	92.5	10.9		37.0	
E23506E		7 days	81.1	9.4		33.7	
E23607	High PR AP		73.4	10.1	36.5		
E23846A	Tripropionate	1 1/2 hours	96.6	1.4	49.9		
E24189B	ROP acetate	24 hours	97.2	42.3			
E241890	"	36 hours	93.9	31.4			
E24189D	"	48 hours	87.1	40.7			
E24189E	"	60 hours	77.5	40.0			
E24812B	4x Nitro		98.0				43.7 (N2=0.88)
E248120	acetate		95.3				41.8 (N2=0.92)
E24821B	4x Isobutyrate	(50 gm bottle runs)					
E2517E	4x Acet. Crotonate		33.6	37.0		5% (crotonyl)	
E25180B	1x acetate	for base (Dr. Madeau)					
E25327A	4x AP		87.9				42.8
E25327B	16% PR		87.4				41.7
E253270			89.9				41.8
E25402-406	4x AP	For base (Dr. Madeau) (bottle runs)					
E25514-A	Hydrolysis of	TEG 3460-61	No analysis sent to Dr. Madeau				
E25514-B	3460-61)						
E25520A	Hydrolysis of						
" B	TEG 3460-61						
" C							
" D							

6/6/57  
M

- page 2 -  
List of Cellulose Esters

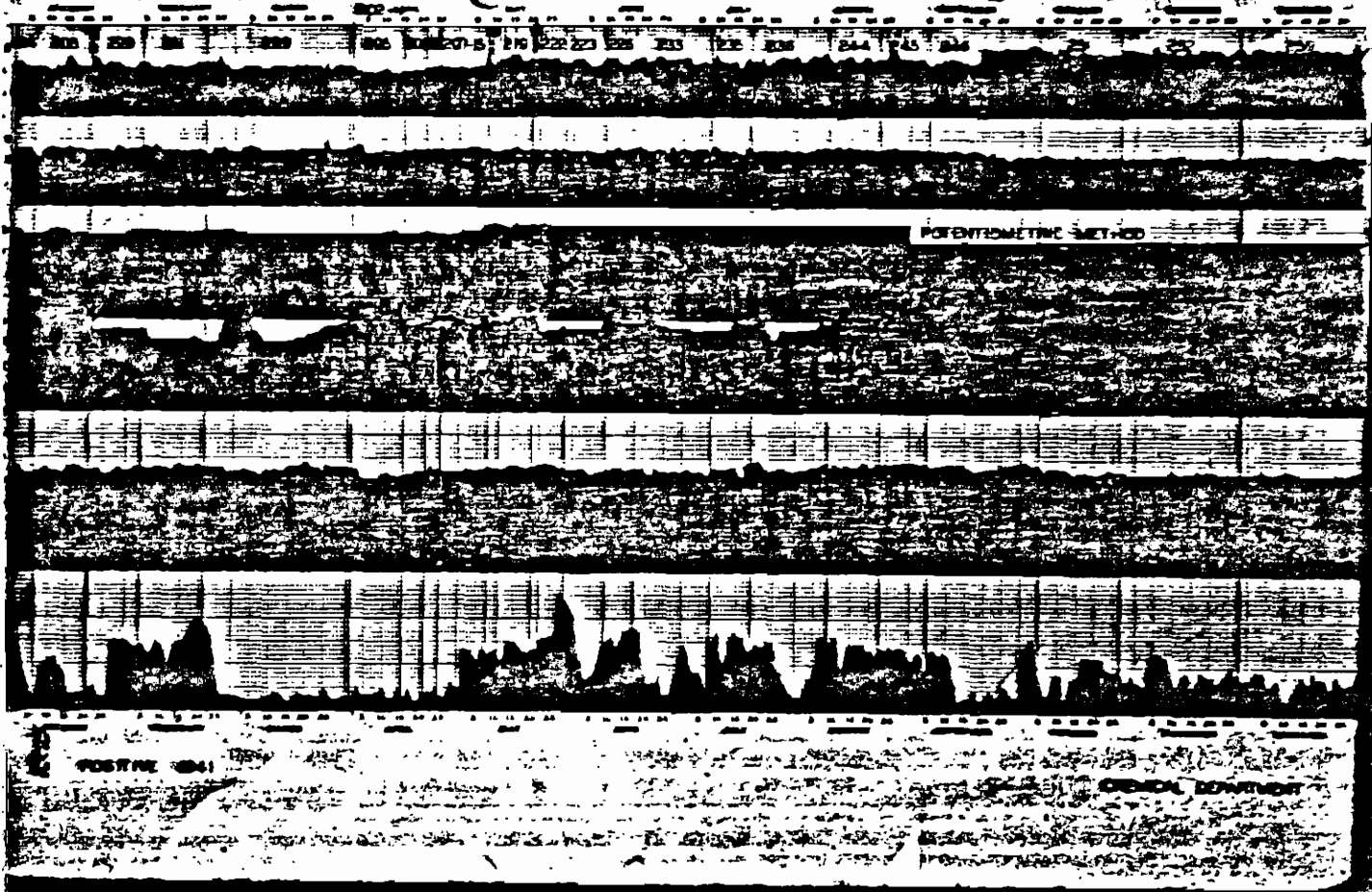
	Type	PV	Acetyl	Propionyl	Butyryl	Vinyl Alc.	Vinyl Acet
E26027B	4x ADFO-24		25.4				
E27559A	4x	95.1	26.2			20.1	
E27559B	AB	94.9	25.8			19.7	
E27559D		94.4	25.0			19.0	
E27745A	Hydrolysis of Herocose O350	94.3	23.0			15.7	
E30192	Formvar Resin		8.3			18.0	49.8
E30285	"					11.2	39.9
E30288	"					10.8	39.2
E30289	"					12.1	31.3
E30297	Alvar Resin					13.5	27.1
E30347	N Amyl Resinic Lactone Resin		4.4			(maleic acid 6.8)	8.8
35196-97)	SOP AQ	68.0	39.8				
35200-01)		68.0	40.2				
A-10	This is not a batch number						
A-11 2225-26	RSOP		39.3				
A-12 14281-82	CSA		41.2				
49-A-858	SOP	88.0					
E V 29	Oxidized SF acetate						
E VI 75 R	Ethyl cellulose	43.7%	ethoxyl				

*6/1/50  
 yu*

Not very much information  
 on these as they are not from  
 EVO 5050.

RK

PARAMOUNT WEST COAST  
LABORATORY  
DAILY SERVICE CENTER



set Explanation of T

6/6/50  
JLB

FORMAMIDE (CH<sub>2</sub>)

6/6/50  
21

Formamide is made from methonal, sodium, and CO gas. The catalyst is made by mixing 125 lbs. of sodium and 150 gal. of methonal gas. To begin with 25 lbs. of sodium is put into 150 gal. of methonal. Then as the reaction goes along 12½ lbs. cakes are added every thirty minutes, until the required amount is reached. The final addition is made 4 hours before using.

1 to 19 portion of catalyst with methonal gas respectively, plus CO gas is used.

2/4/50  
210

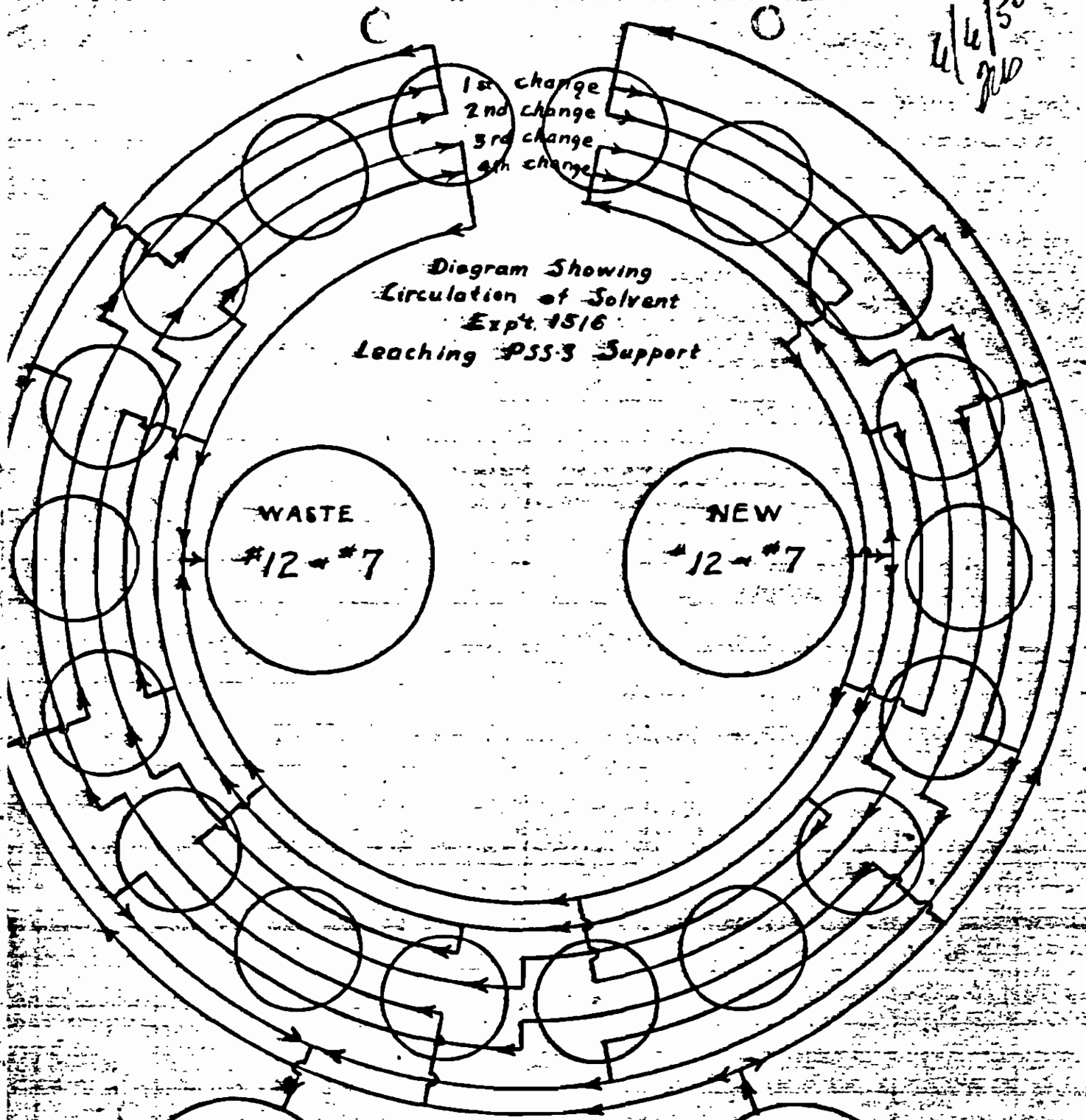





Diagram Showing  
Circulation of Solvent  
Expt. 1516  
Leaching PSS-3 Support



-  #1 Leacher
-  #2 Leacher
-  #3 Leacher

Best Bureau 6-12-50 9-18-50  
Add from file

Date Received 6-6-50

From 6127 Head of Hill Co  
(Name of Contributor)

7227 Kenilworth St, Pitt  
(Contributor)

By F. C. Bittly  
(Special Agent)

To Be Returned Yes ( )  
No (X)

Description: all above

File No. 45-1387-1-B-10(3)

Make folder captioned

"Mr. Baybutt, Dept. Director"

May 15 from 32 Enid

11/14/50

11/14/50 all back

changed for 24/11/50

the folder captioned

"Mr. Baybutt, Dept. Director"

May 15 from 32 Enid

11/14/50

11/14/50 all back

changed for 24/11/50

the folder captioned

"Mr. Baybutt, Dept. Director"

May 15 from 32 Enid

11/14/50

11/14/50 all back

changed for 24/11/50

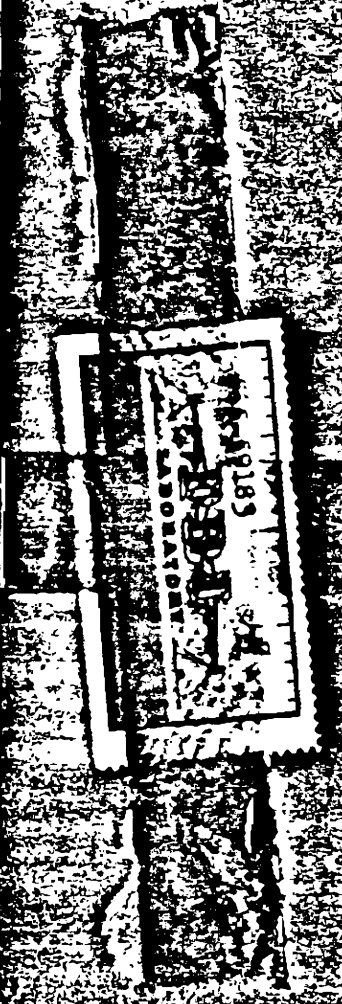


These items  
not reported  
& not reported  
to Albany

Memo folder leaving after  
Mr Bayhutt  
Navy Inventories, usage  
3rd Period, 1942  
Graphs all work  
done in April, 1942  
Graphs captured Plastic  
Inventories usage  
3rd period 1942  
VII  
photo  
1 per  
Buffalo

W. K. O.  
A. B.  
J. K.

ITEM #11  
PHOTO FILE #65-4307-1B-10(3)



150  
27  
Mr. Baybutt

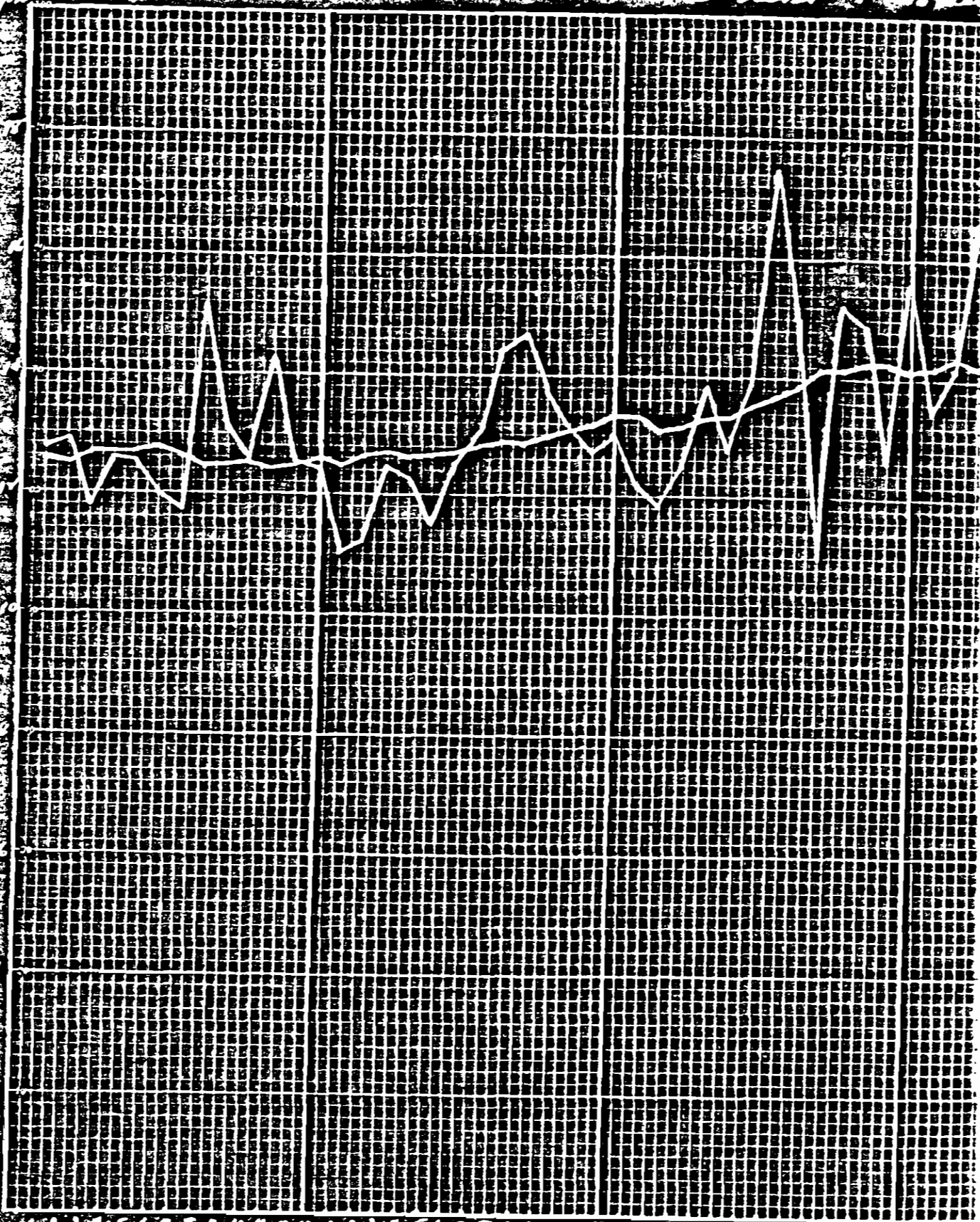
DOPE INVENTORIES, USAGE AND LOSSES  
3rd Period 1942

0/0/2  
201

Acetone Losses

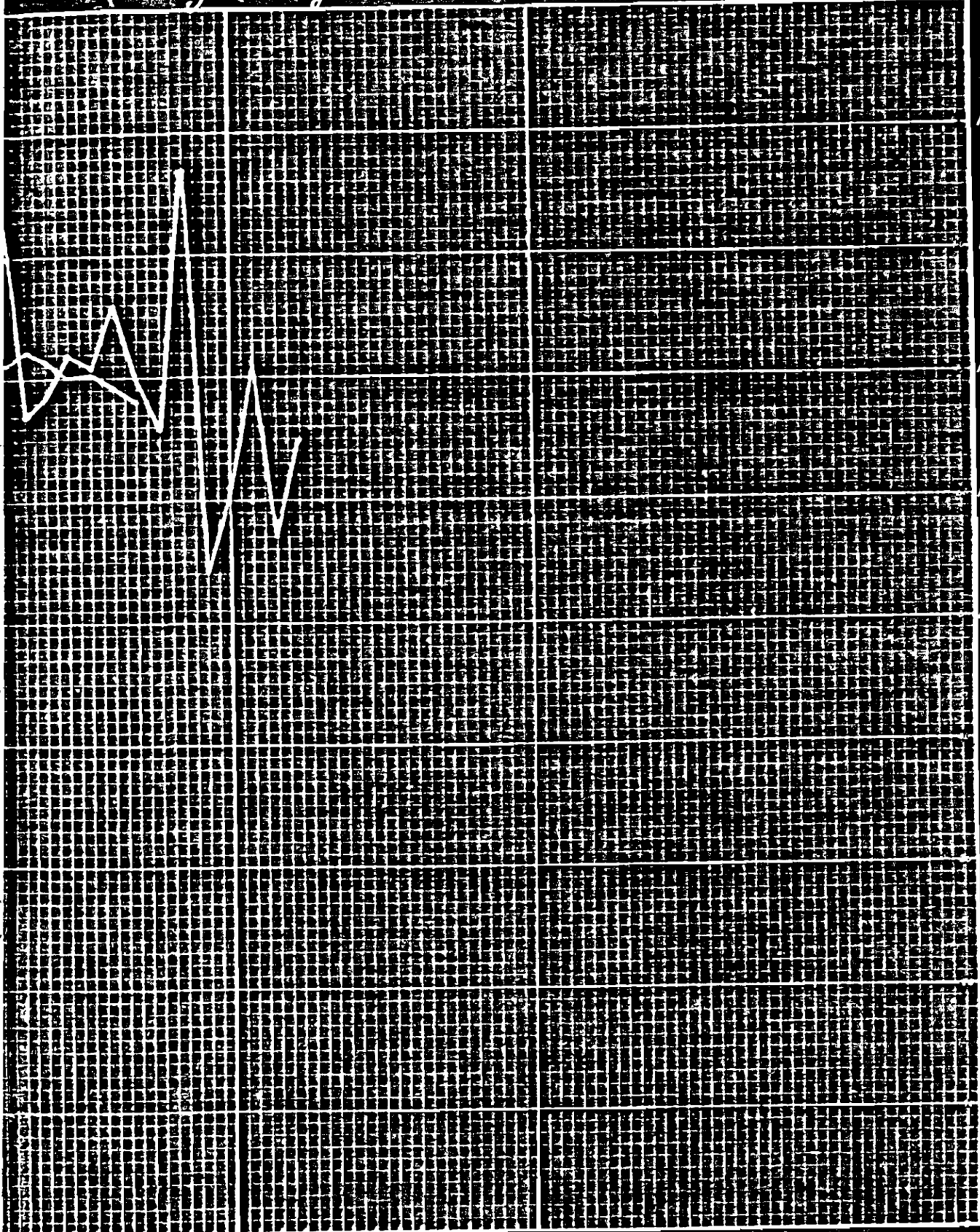
ISSUED BY  
E. B. REPT. L. G. CO. L. P. WKS.  
APR 22 1942  
TO

10/20/54  
10/20/54  
Current 10/20/54



Park  
House  
Merry Average Central

16.5



15

14

13

12

11

10

9

8

7

6

5

1941

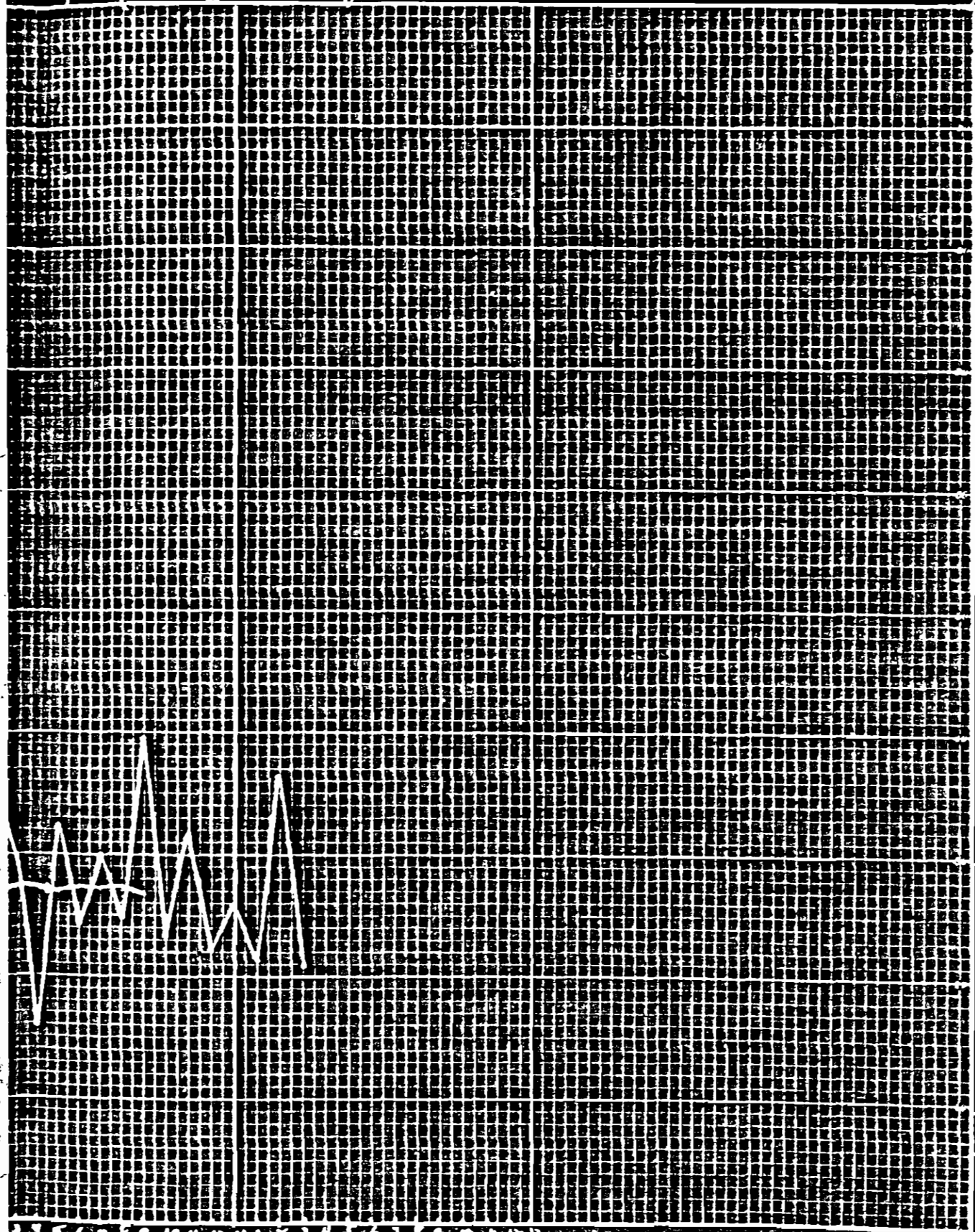
1942

6/4/42

Methanol Losses

RECORDED BY  
E. B. ROY, JR. & CO. R. D. 1722  
APR 22 1942  
30

*h. Park  
and  
Period Moving Average Centered*



*1974-1975*



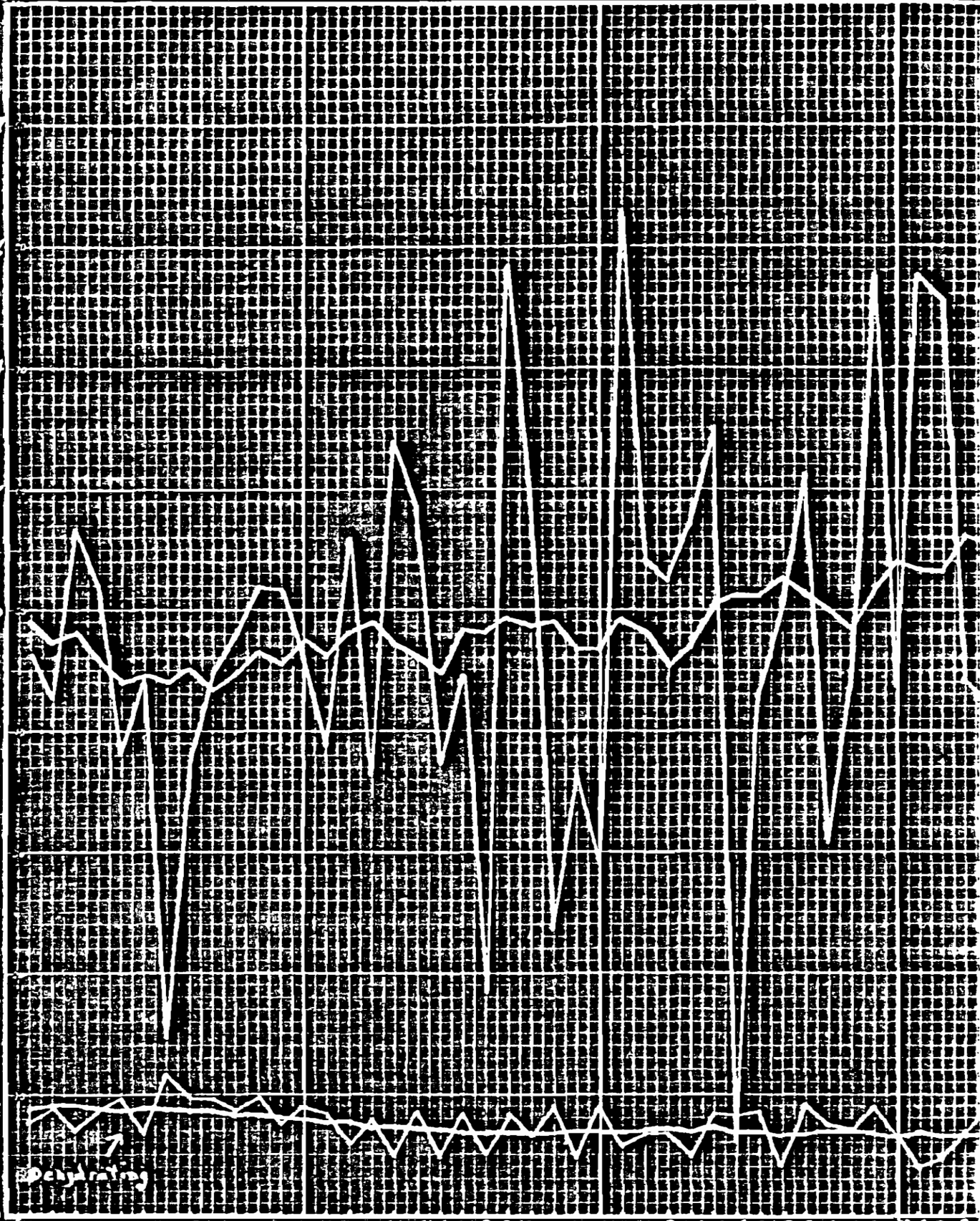
6/4/42

Butanol Losses

ISSUED BY  
E. & H. KYLE, L. P. WKS.  
APR 22 1942  
30

*Godak  
Butanol-stone  
Current 13 Period*

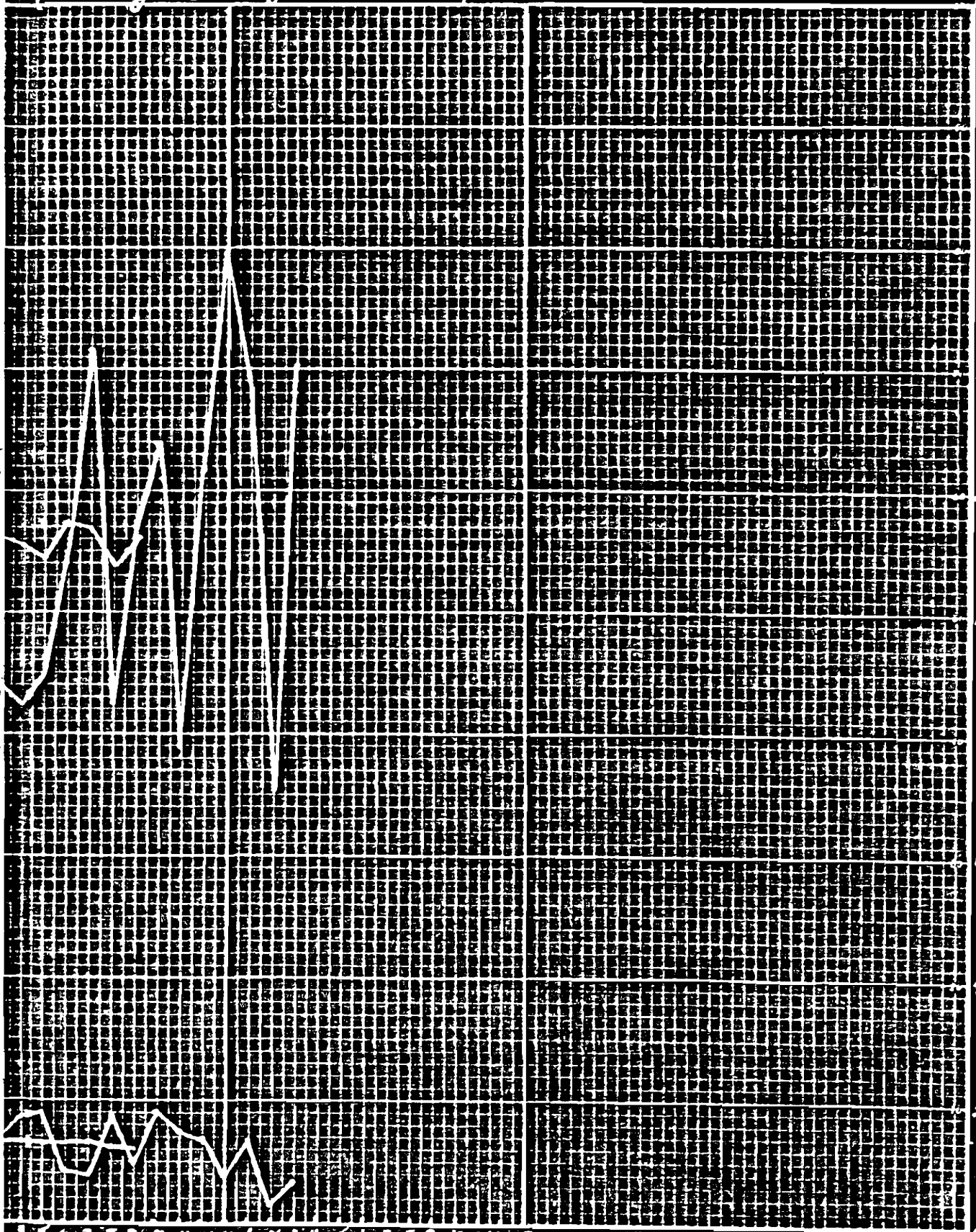
*After*



*Dehydrating*

1938 1939 1940

Park  
w/ Dope & Dehydrating  
Moving Average Centered



4/20

15

16

17

18

19

20

21

22

23

24

1911

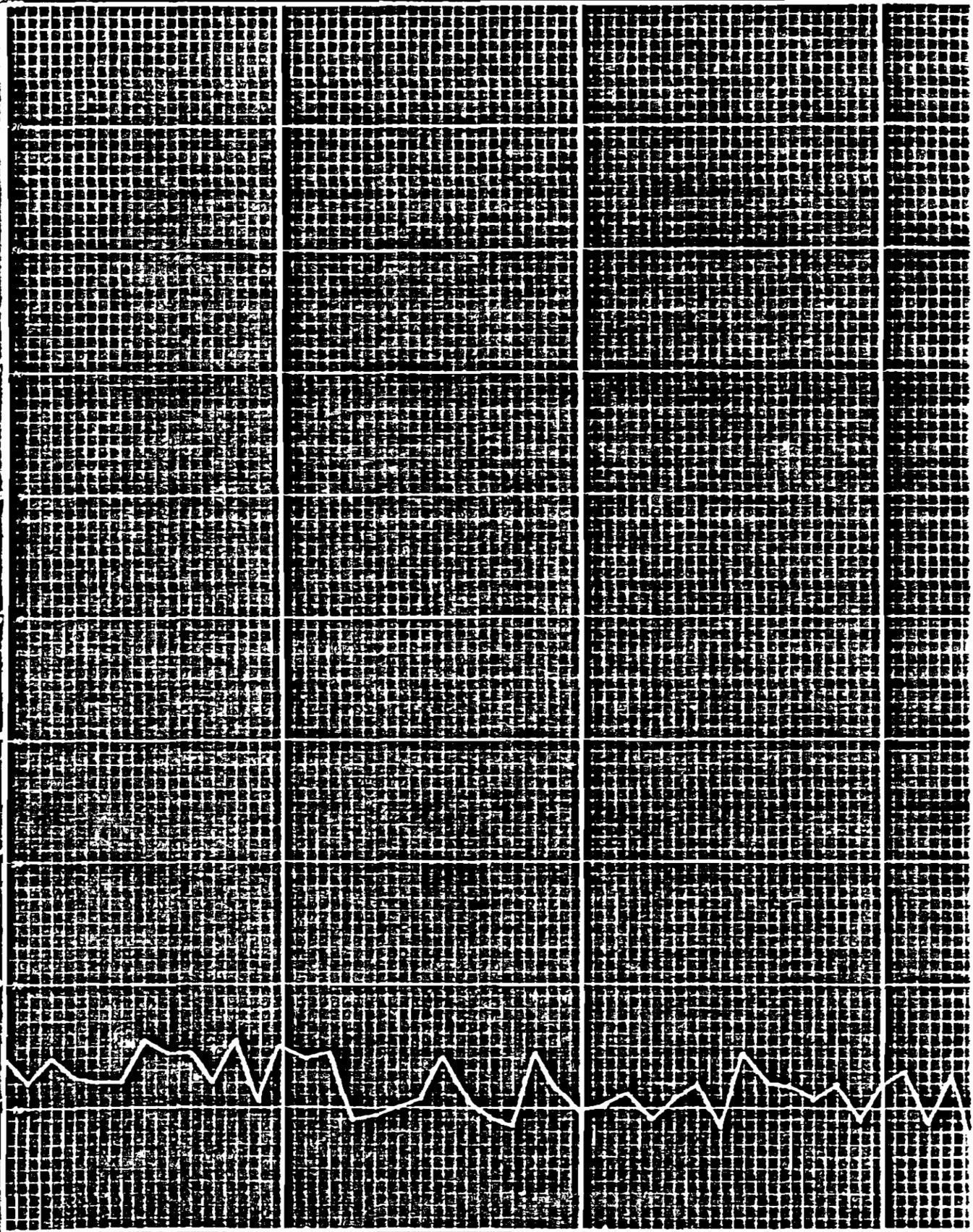
1912

6/6/30

Lbs. of Butyl Alcohol Lost  
Per Lb. of Cotton Dehydrated

ISSUED BY  
E. B. BOYD, E. A. CR. & F. W. WALKER  
APR 22 1942  
TJ

KODAK SAFETY FILM  
POUNDS OF BUTYL ALCOHOL LOST PER POUND

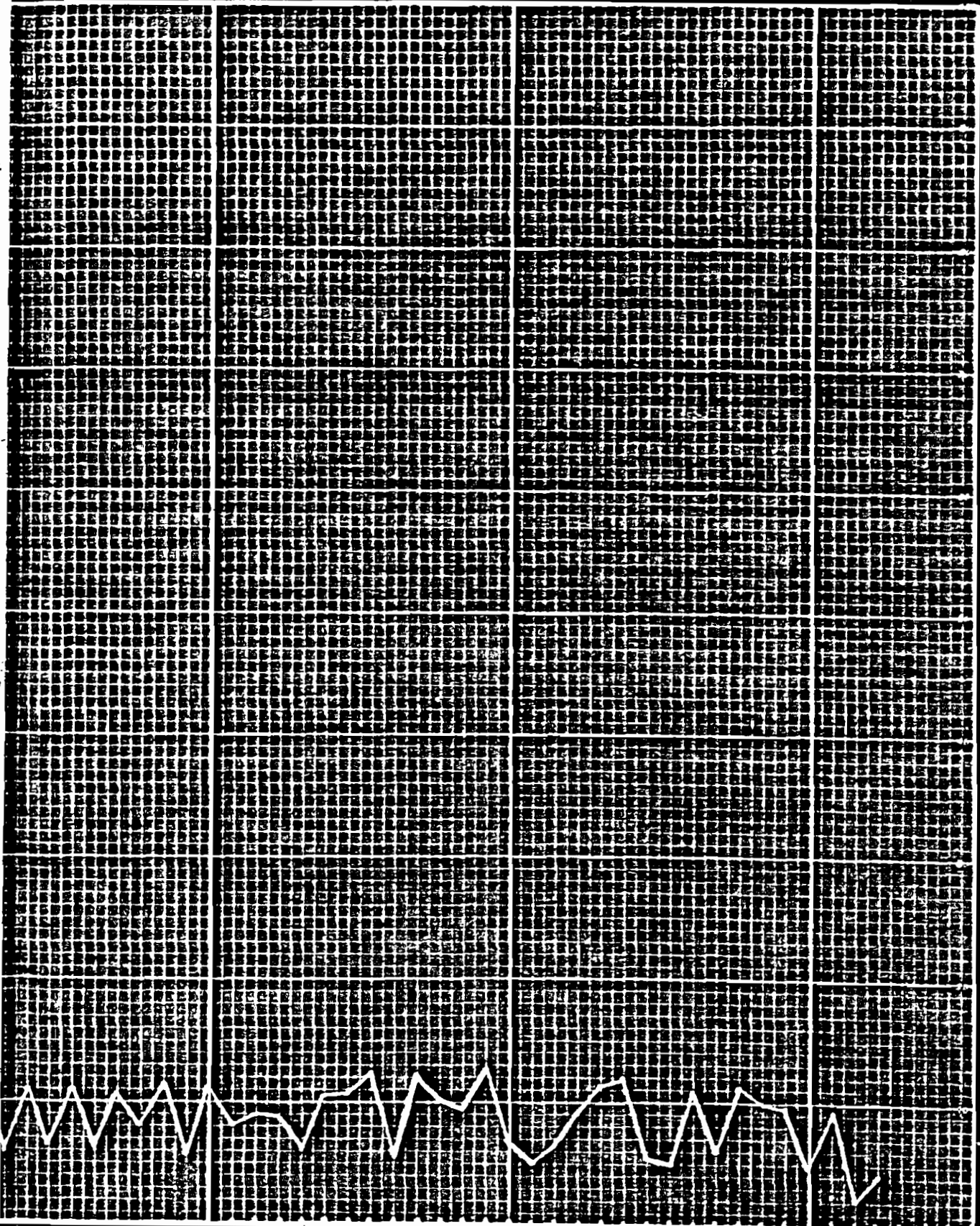


1936

1937

1938

BU OF NITRATE COTTON DEHYDRATED

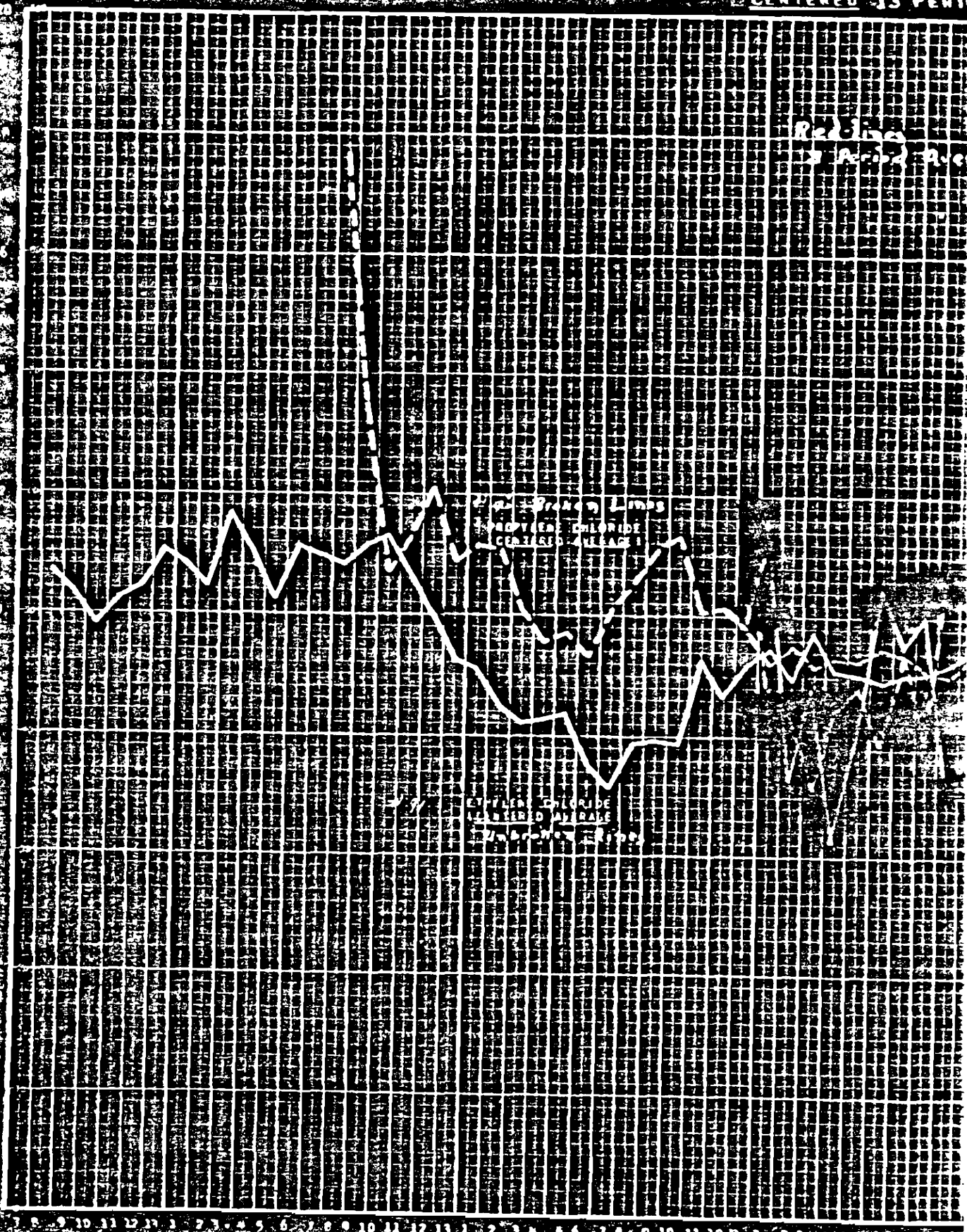


1929 1930 1931 1932

6/6/42

13 Per. and 3 Per. Averages  
Propylene Chloride and  
Ethylene Chloride Losses

100-26-107  
E. & P. RESEARCH & DEVELOPMENT  
APR 22 1942  
10



1935

1947

1958

1967

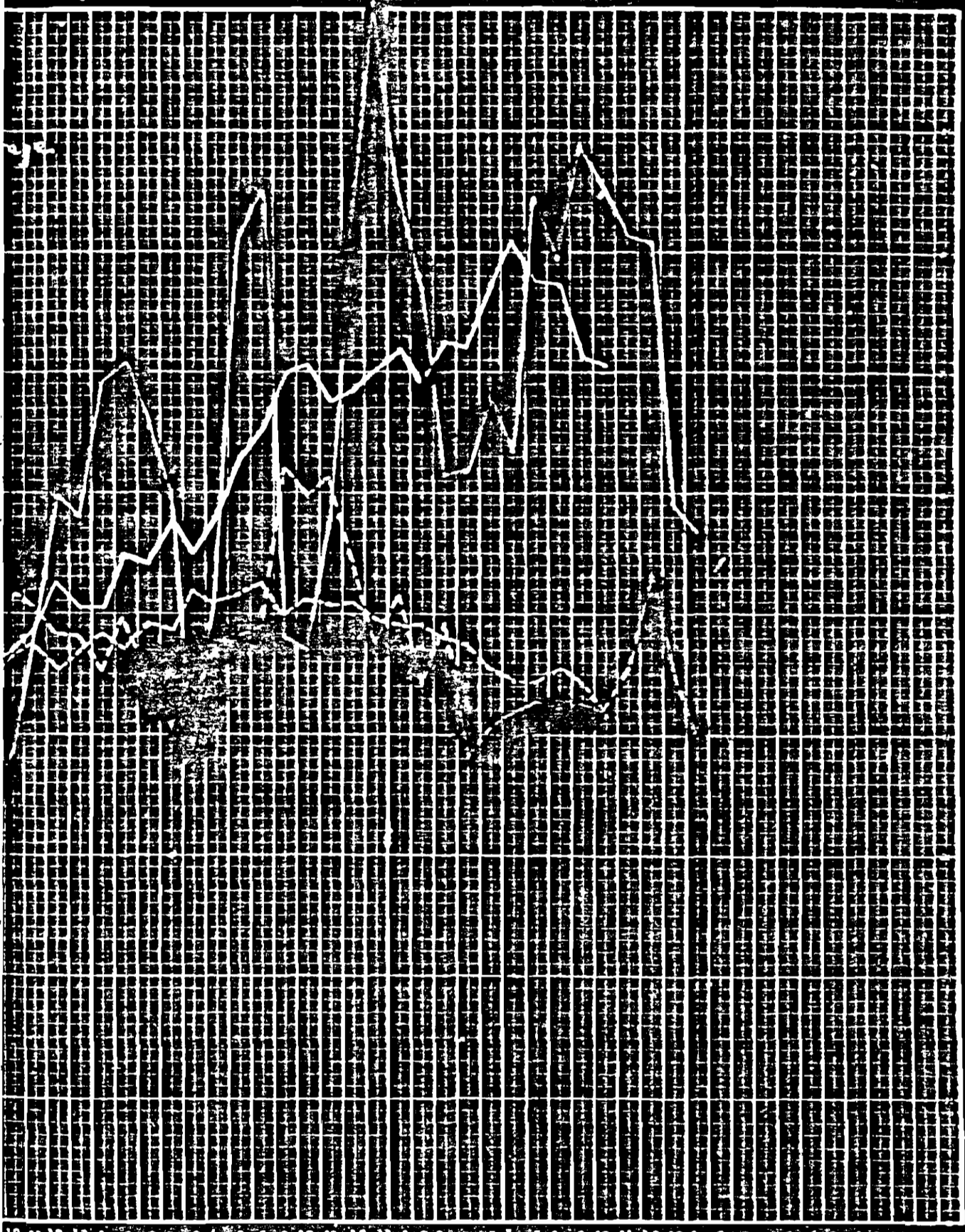


K WORKS

# ETHYLENE CHLORIDE LOSSES

D MOVING AVERAGE

5 of  
LOSSES



10 11 12 13 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

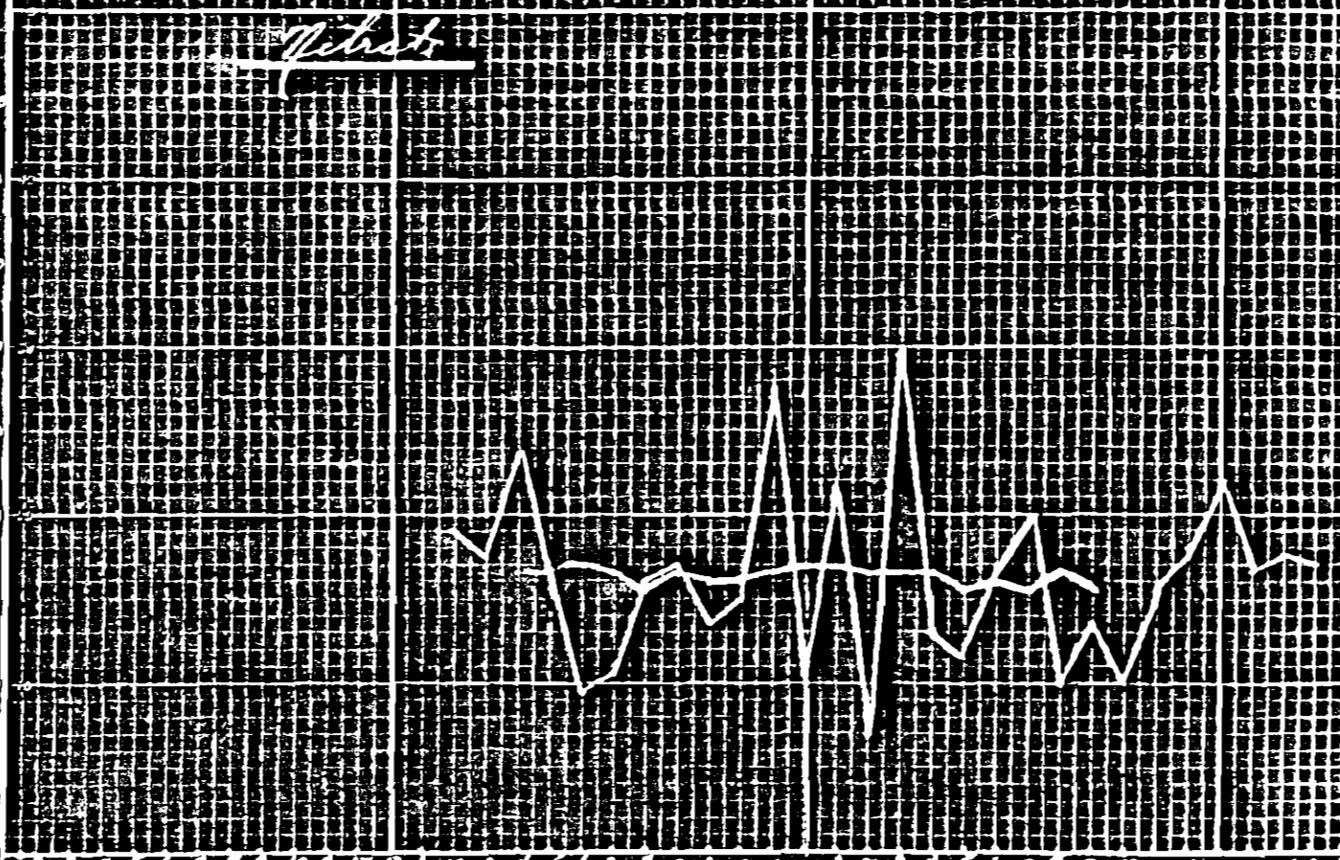
STATISTICS  
MATERIALS AND

6/4/42

Lbs. of Solvent Lost per  
Lb. of Scrap Leached

RECEIVED  
LABORATORY  
APR 22 1942  
10

Leaching of  
solvent lost



1940 1941

*Lab of Army Lacked*

The image shows a sheet of graph paper with a grid of small squares. A vertical margin is present on the left side, consisting of a single column of squares. The rest of the page is a wide grid of squares. The grid is mostly empty, with some faint, illegible markings scattered across it. The paper is framed by a dark border.

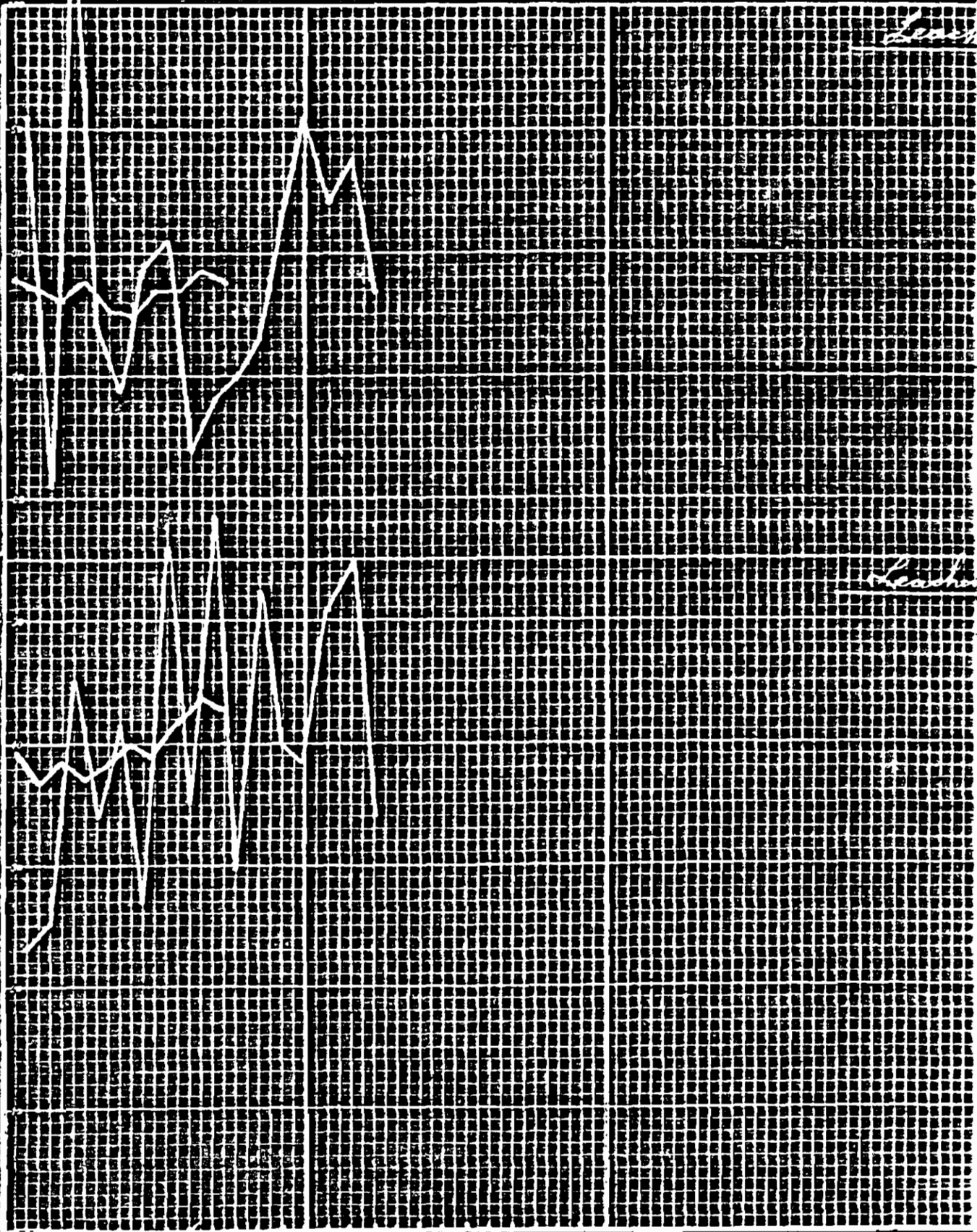
107 8 9 10 11 12 13  
1942

6/6/50  
WCB

Leacher Losses

ISSUED BY  
E. S. H. H. P. L. R. G. L. P. W. H. A.  
APR 22 1942  
TO

Leather  
Current 1/13/42

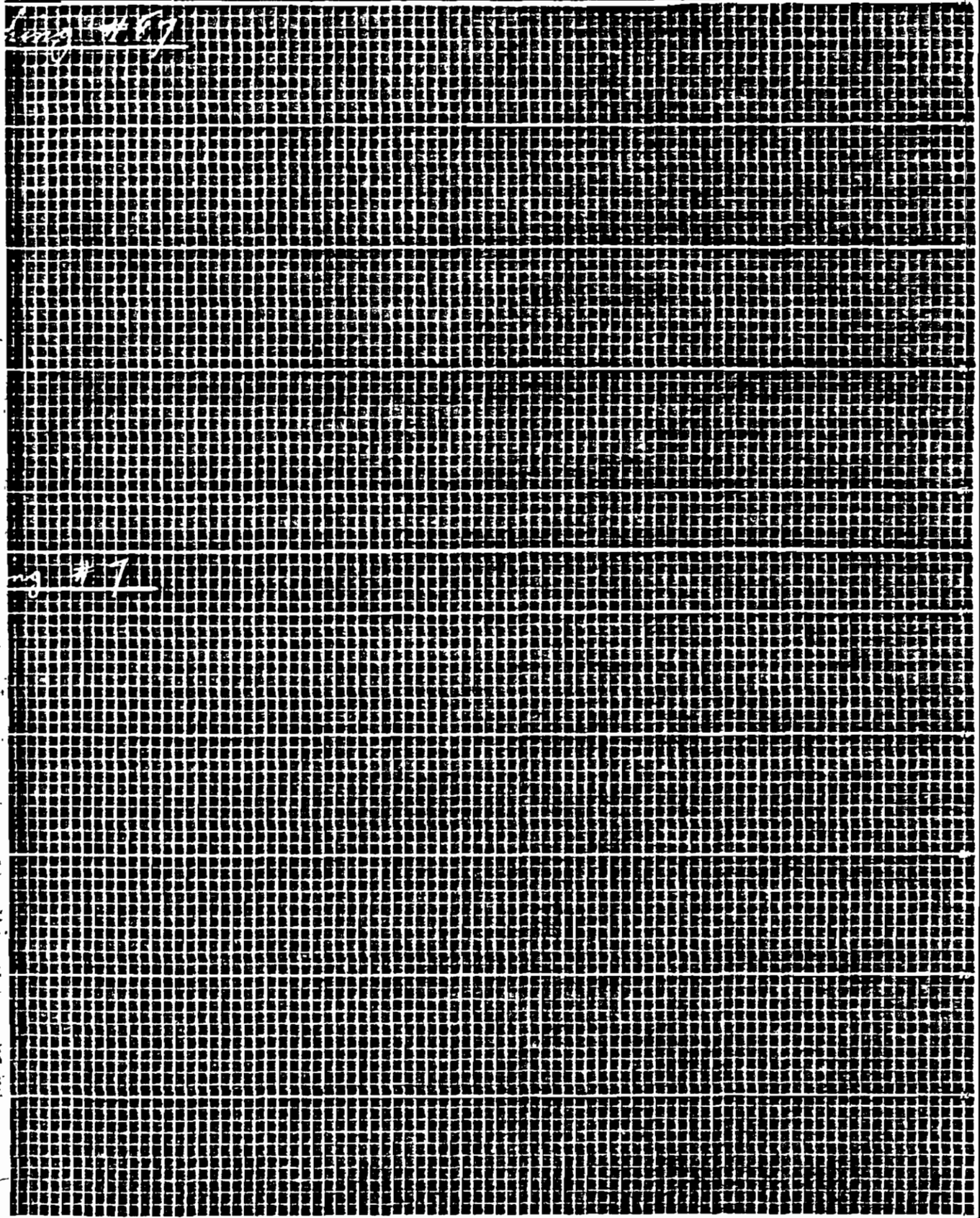


10  
9  
8  
7  
6  
5  
4  
3  
2  
1  
0  
-1  
-2  
-3  
-4  
-5  
-6  
-7  
-8  
-9  
-10

10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10

1941 1942

Loss  
Roads Moving Average Centered



6/10/42  
JCS

Combined Propylene Chloride  
and Ethylene Chloride Losses

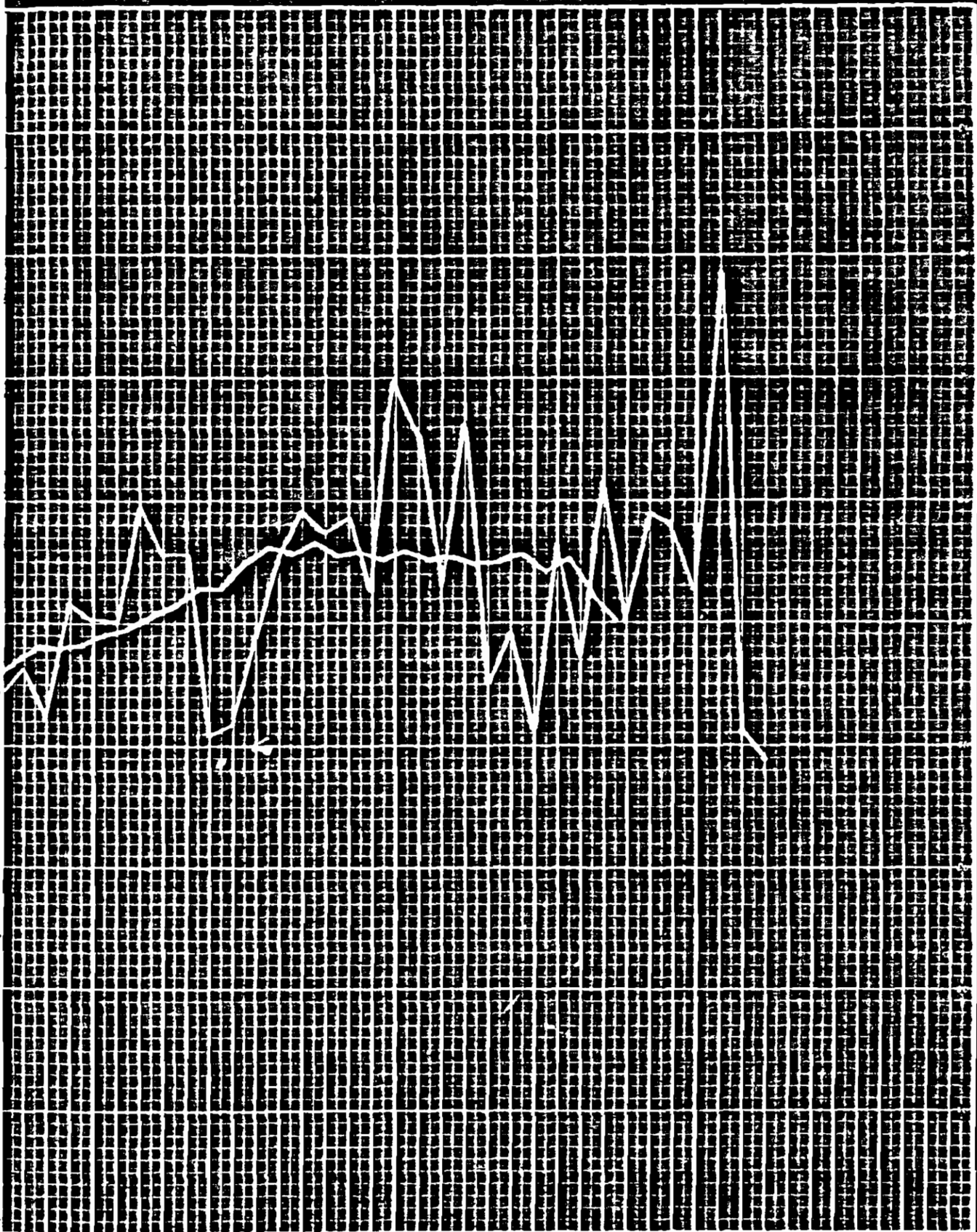
ISSUED BY  
E. & B. DEPT. L. & CO. & P. WKS.  
APR 22 1942  
TO





WORKS  
CHLORIDE AND ETHYLENE CHLORIDE  
MOVING AVERAGE CENTERED

8 OF  
LOSS



10 11 12 13 1 2 3 4 5 6 7 8 9 10 11 12 13 1 2 3 4 5 6 7 8 9 10 11 12 1940 1941 1942

STATISTICS  
MATERIALS ARE  
JUN 26 1939

6/10/51  
JAC

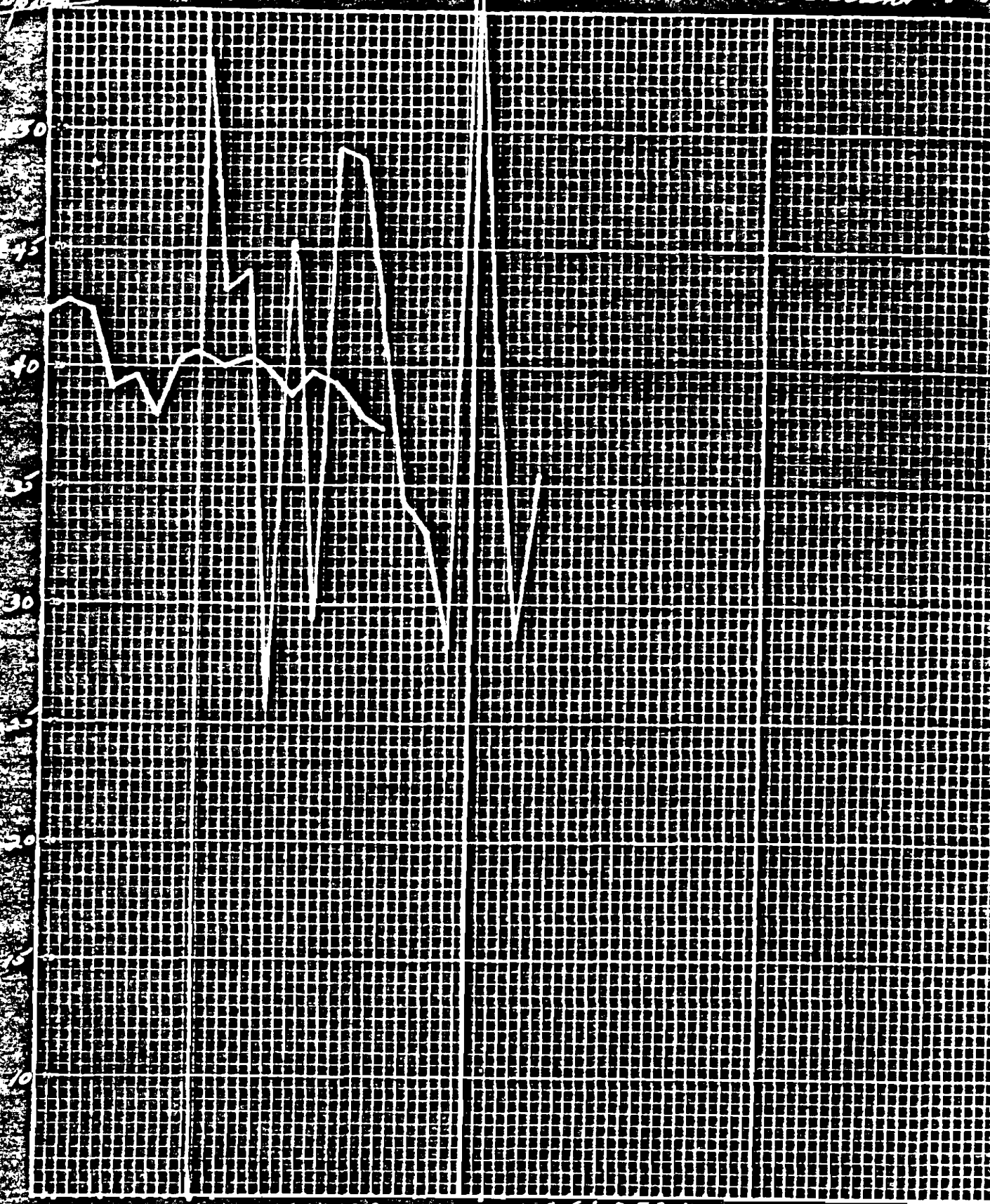
Cyclohexane Losses

INDEX BY  
E. A. WILSON & C. W. WILSON  
APR 22 1942  
TJ

*7/2*  
*Cycle*  
*Current +*

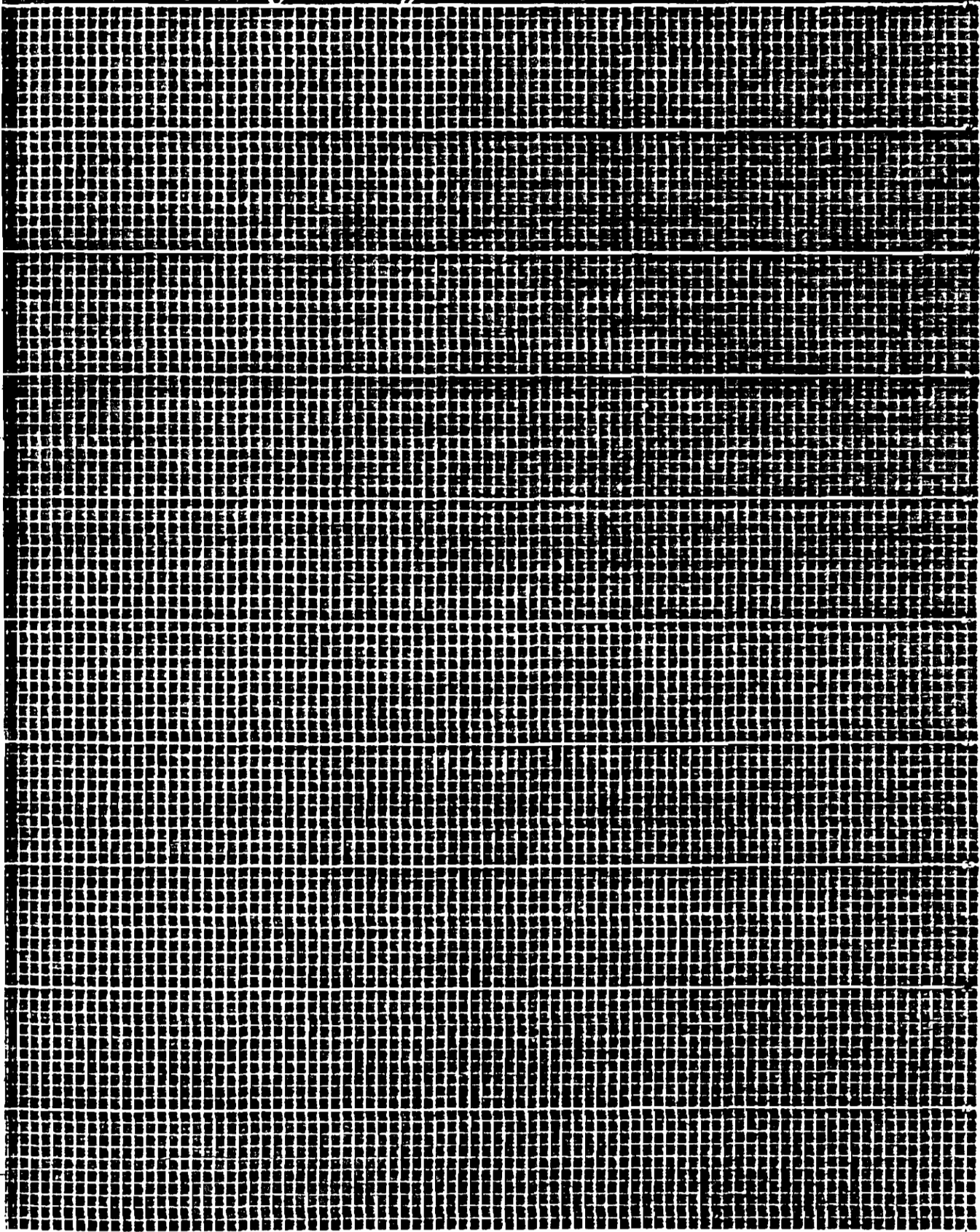
*4/10/68*

*3.53*



*1 2 3 4 5 6 7 8 9 10 11 12 13*  
*1991 1992*

data set  
before losses  
is kind of average centered



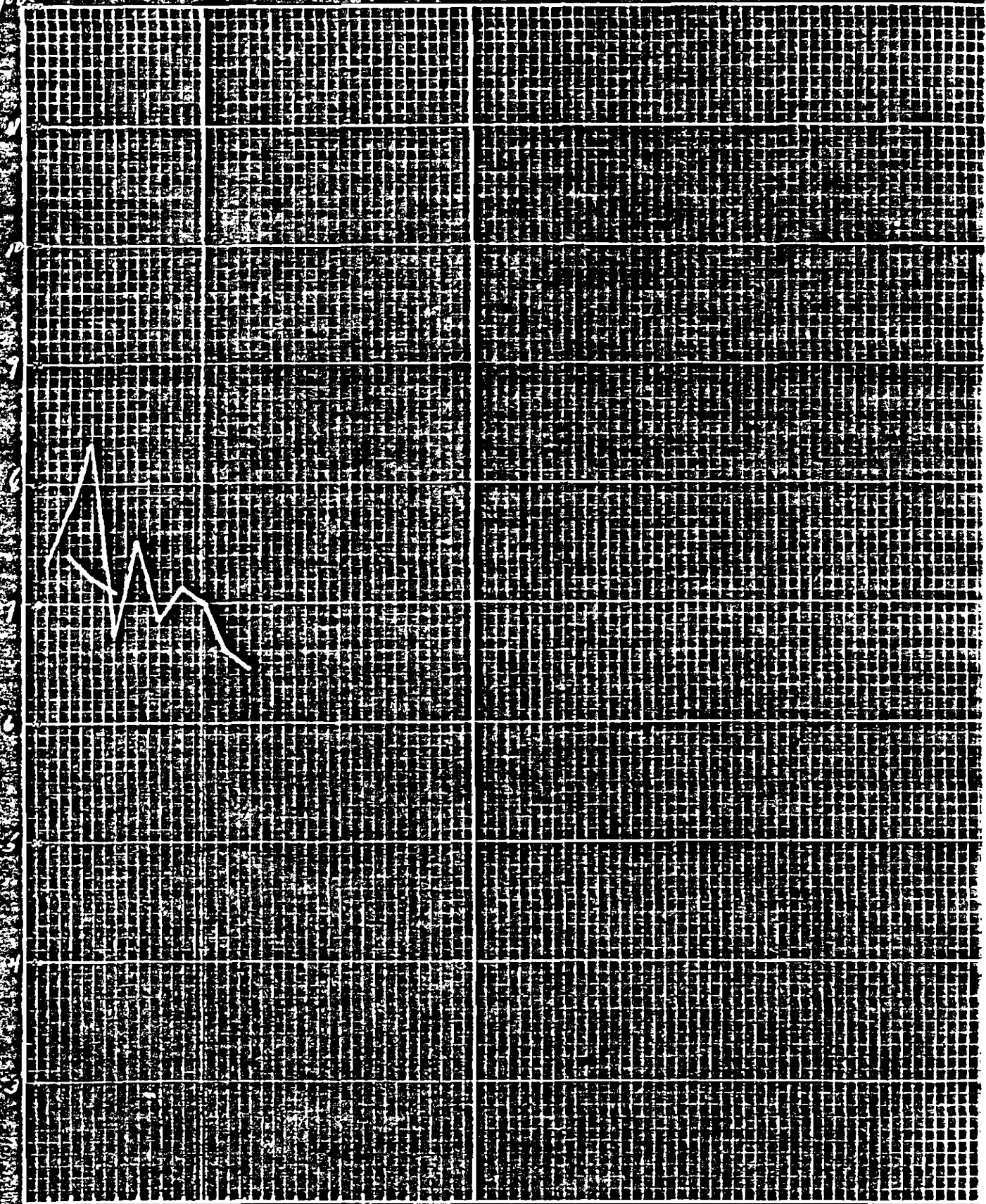
6/6/50  
JK

Total Solvent Losses

ISSUED BY  
E. B. W. P. L. C. L. P. W. S.  
APR 22 1942

*Kodak*

*Kodak  
Total Solvent  
Current & 13 Per*



1941

1942

6 Park  
House  
code Moving Quize

The image shows a large, rectangular grid of graph paper. The grid is composed of many small squares, with horizontal lines separating the rows and vertical lines separating the columns. The grid is mostly empty, with no text or markings inside the cells. The grid is set against a dark, textured background. At the top of the page, there are two circular punch holes. In the upper left corner, there is handwritten text in cursive: "6 Park", "House", and "code Moving Quize".



Plasticizer Inventories, Usage & Losses  
 3rd Period 1942  
 13 Period to Date Averages

	Comphor		Triphenyl Phosphate		Dibutyl Terephthalate	
	3rd Per. 1942	13 Per. to Date (Avg.)	3rd Per. 1942	13 Per. to Date (Avg.)	3rd Per. 1942	13 Per. to Date (Avg.)
Inventory Available	75605		47506		77485	
At Available	64689		34313		19399	
to them Support	21713	39236	74591	73884	8817	33162
Support Loss #	19257		74591		8817	
Handling Loss #	8406		10000		10000	
Total Film Loss #	17857	32981	77261	73814	8476	33073
	8209	18406	9956	9991	9962	9773
Sales to others	-		540		-	
Purchases Prod.	53000		-		408	
Recd. in Scrap	1049		5492		1580	
Recd. from Leaching						
Total Receipts	34049		5492		1988	

Trucks, Wagons & Lenses 3rd term 1942

Set Average

Alcohol #87 13 lbs. to 3rd term (ave)	Amyl Acetate #1 13 lbs. to 3rd term (ave)	Eth. Chloride #91 13 lbs. to 3rd term (ave)	Prop. Chloride #95 13 lbs. to 3rd term (ave)	Cycolhexane 13 lbs. to 3rd term (ave)
4248	92098	615763	737970	277038
41740	56664	245983	259864	230888
4199	—	74743	2510	—
—	94394	581521	2096106	124596
4199	94394	56264	2098616	124596
4446	59505	592360	1447589	1203
4500	—	—	—	—
—	—	51637	—	—
—	—	8120	—	—
—	—	124	—	—
—	—	321	—	—
—	—	47	—	—
9214	—	13488	—	—
7.00	—	18.05	—	—
2700	16511	47569	354	—
3.65	17.49	7.25	19.10	—
914	16511	65960	167360	43623
0.65	17.49	10.05	7.97	35.01
898	—	—	148330	120307
6.37	—	—	7.07	8.31
683	—	—	—	—
0.61	—	—	—	—
—	—	18529	—	—
9214	—	3588	—	—
3759	16511	85734	148330	44023
784	—	85700	80400	166000
Combined # 914 # 95 13 lbs. to 3rd term (ave)				

*Material Statement Showing Inventory*  
 13 Period to

	<i>Account #7</i>		<i>Method #12</i>		<i>Detail #63</i>	
	<i>13 Per. to 3rd Per. Date (Am.)</i>		<i>13 Per. to 3rd Per. Date (Am.)</i>		<i>13 Per. to 3rd Per. Date (Am.)</i>	
<i>Inventory</i>						
<i>Total R.P. Inv Available (New &amp; Rec.)</i>	<i>2,166,169</i>		<i>2,435,911</i>		<i>912,554</i>	
<i>Invest the Distribution the for Subbing the for supporting copy</i>	<i>415,486</i>		<i>561,600</i>		<i>698,863</i>	
<i>Loss the for Subbing</i>	<i>470,368</i>		<i>100,512</i>		<i>15,020</i>	
<i>Loss the for supporting copy</i>	<i>1,613,136</i>		<i>3,626,142</i>		<i>495,988</i>	
<i>Loss the for Film</i>	<i>2,083,504</i>	<i>2,144,313</i>	<i>4,629,254</i>	<i>4,409,196</i>	<i>511,008</i>	<i>489,199</i>
<i>Lacking the</i>	<i>362,298</i>	<i>273,309</i>	<i>113,851</i>			
<i>Dehydrating the</i>					<i>502,334</i>	<i>308,027</i>
<i>Paper Coating the</i>						
<i>Distribution</i>						
<i>3rd Per. to 3rd Per. Date #</i>	<i>33,681</i>		<i>19,572</i>			
<i>of</i>	<i>1.63</i>		<i>0.42</i>			
<i>of Making Handlings #</i>	<i>11,516</i>					
<i>of</i>	<i>55</i>					
<i>Subbing Loss (Stand) #</i>	<i>99,585</i>		<i>68,938</i>		<i>4,046</i>	
<i>of</i>	<i>21.17</i>		<i>6.87</i>		<i>26.94</i>	
<i>Support Loss #</i>	<i>105,567</i>		<i>139,873</i>		<i>67,584</i>	
<i>of</i>	<i>6.03</i>		<i>3.02</i>		<i>13.23</i>	
<i>Total Film Loss #</i>	<i>2,703,491</i>	<i>2,915,307</i>	<i>1,935,400</i>	<i>2,358,547</i>	<i>70,847</i>	<i>54,954</i>
<i>of</i>	<i>12.78</i>	<i>13.60</i>	<i>4.18</i>	<i>5.35</i>	<i>14.07</i>	<i>11.23</i>
<i>Lacking Loss #</i>	<i>39,106</i>	<i>34,265</i>	<i>4,057</i>			
<i>of</i>	<i>10.79</i>	<i>12.54</i>	<i>36</i>			
<i>Dehydrating Loss #</i>					<i>20,446</i>	<i>36,872</i>
<i>of</i>					<i>67</i>	<i>1.20</i>
<i>Paper Coating Loss #</i>						
<i>of</i>						
<i>Sold to others (except N.C.)</i>	<i>149,987</i>		<i>58,533</i>		<i>45,691</i>	
<i>P Consumption</i>	<i>449,446</i>		<i>231,512</i>		<i>137,667</i>	
<i>Purchases Rec'd</i>	<i>554,338</i>		<i>161,040</i>		<i>110,355</i>	

Sent Bremen  
6-12-50  
ret'd from  
Feb 7-11-50

Date Received 6/6/50  
From Leach of Gold's Postcard  
(Name of Contributor)  
6823 Leach of Gold's Postcard  
(Contributor)

By F. J. Burger  
(Agent)  
To Be Returned Yes ( )  
No (X)

Description:  
see attached  
File No. 15-4307-1-8-10(4)

Handwritten notes at the top of the page, possibly including a date like "April 1, 1933".

A report on Plate Counting *with* *method*  
dated 10/5/35

Also 2 graphs on G. G. RATON EXPERIMENT  
method of operating machine above  
upper exposure limit

Minutes of meeting, Sept 27, 1933  
Report on improved "KODATRACE"  
Proposed changes in Venturay for  
machine located in Bldg 20  
~~Handwritten text~~ Bldg 46, Dec 19, 1933

65-4307-1-B-20(4)

Handwritten signatures and notes, including "Ch. S. ...", "at ...", and "No. 1 ...".

Handwritten initials or a small signature in the bottom right corner.

ITEM TR

PHILA FILE 65-4307-1-B-10(4)



REPORT

of

PLATE COATING TESTS ON MOBILIZED R-21 DOPE.

Historical.

In the past year a method has been found by which an all methyl alcohol soluble nitrocellulose can be made with a yield which, in small experiments, compares favorably with those obtained with P. R. and R. P. types.

Five dope experiments:

- X-5078- M.E. 1313.
- X-5099- M.E. 1354
- X-5102- M.E. 1359
- X-5126- M.E. 1384
- X-5129- M.E. 1396

have been made using this nitrocellulose in a formula consisting of

98% #12  
2% #7  
10% #3

in these experiments in which film was obtained for examination. Of these experiments two gave film of poor physical quality and one gave film of quite good quality.

Purpose.

In an effort to explain the above results and to assist in planning a course for future work with this type of dope; the following work was undertaken.

Plan of Investigation.

In this work an attempt has been made to study the effect of the following variables on the tear and folds of film support.

- a- Absolute humidity.
- b- Time and temperature of curing before stripping
- c- Temperature during shrinking period corresponding to that period in the air section of a roll coating machine.
- d- Tension during curing.

2/12/50  
ms

Summary of Results.

1. The higher the absolute humidity, the higher the tear and folds.
2. The effect of extracuring before stripping varies with the dry bulb temperature, the absolute humidity being the same. At dry bulb temperatures between 95 and 100F. the tear increases with the time of curing. At a dry bulb temperature of 125F. the tear decreases with the time of curing.
3. Film of slightly higher tear is produced if the temperature during the shrinking period is not too high. It is better to cure at a temperature of 120-130F. than at 160-170F.
4. The lower the tension immediately after stripping the higher the tear and, in general, the lower the folds.

Discussion of Results.

Consideration of the above results has led to the adoption of the following theory.

The tear strength and, to a certain extent, the folds of a support made from any dope formula high in alcohol will be dependent on the amount of shrinking which takes place during curing.

Let us examine the above results in the light of this theory.

1. The higher the absolute humidity the higher the tear and folds. It has repeatedly been noticed that support coated at a high humidity sets to a gel very quickly and can be stripped from the plate. Such a support has a great tendency to shrink and also to overcome tension. For example, modified R-25 dope coated at a dry bulb of 112F. and a wet bulb of 102F., a relative humidity of 70%, gave a skin of .0061" thickness, whereas the same dope coated at a dry bulb of 112F. and a wet bulb of 80F., a relative humidity of 26%, gave a skin of only .0045" thickness with the same knife setting. The average tear of the former was 150 and of the latter 45. The fact that the dope coated at 70% R. H. stripped in 5 minutes, whereas the dope coated at 26% R. H. stripped in 7 minutes is further evidence that the former is in more of a gel state.



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The above coatings were made as follows:

- a- Dope at 110F. was coated on plates at room temperature.
- b- These plates were placed in an oven at 110F. at various humidities.
- c- The supports thus made were stripped as soon as possible and placed on a drying device which permitted the support to be further cured in a warm air oven under various tensions. This drying under variable tension was done for 15 minutes at a temperature of about 150F. It was thought that this procedure would, in a way, correspond to the period in which the support is in the air section of a roll coating machine.
- d- The support was then clamped in a wooden frame and placed in an oven at 212-220F. for 30 minutes.
- e- The support was then held at 50% R. H. at 70F. for 12 hours before testing.

In the above tests in which thicknesses of .0061" and .0045" were reported, the tensions were as follows:

Time.	Weight in Grams Suspended from the Support.
0- 5'	200 g. plus 164.5 = 364.5
5- 10	400 g. " " 164.5 = 564.5
10- 15	800 g. " " 164.5 = 964.5

In anticipation of the question as to the certainty of conclusions drawn from physical data of support of such different thickness, it was thought advisable to lower the tension of the support coated at low humidity in order to bring its shrinkage up to that of support coated at high humidity. (This has certain advantages over a change in knife setting which alters the stripping time markedly and thus adds new variables.) Consequently, an R. P. dope was coated at 23% R. H. at 110F. and cured under the tension of the weight of the lower clamp and pan which was 164.5 g. However, even though this test was made with slightly increased knife setting (3-3/4 increased to 4) the shrinkage was very low, giving a support of tear 67 at .0046" thickness. The same dope coated at a knife setting of 3-3/4 but at 42% R. H. at 110F. (which is just at the point of whiteness for R. P. ) gave a support of tear 80 at .0052" thickness, when cured under the standard tension of 364.5, 564.5 and 964.5 g.

1/12/51

OCT - 5 1932

R E P O R T

DEPT.

OF

PLATE COATING TESTS ON MODIFIED B-21 DOPE.October 3rd, 1932.Historical.

In the past year a method has been found by which an all methyl alcohol soluble nitrocellulose can be made with a yield which, in small experiments, compares favorably with those obtained with P. R. and R. P. types.

Five dope experiments:

L-5078	-	N. E.	1813,
L-5099	-	"	1854,
L-5102	-	"	1859,
L-5126	-	"	1884,
L-5129	-	"	1896,

have been made using this nitrocellulose in a formula consisting of

95% #12,  
2% #7,  
10% #3,

in those experiments in which film<sup>was</sup> obtained for examination. Of these experiments two gave film of poor physical quality and one gave film of quite good quality.

Purpose.

In an effort to explain the above results and to assist in planning a course for future work with this type of dope, the following work was undertaken.

Plan of Investigation.

In this work an attempt has been made to study the effect of the following variables on the tear and folds of film supports:

- a - Absolute humidity,
- b - Time and temperature of curing before stripping,
- c - Temperature during shrinking period (corresponding to that period in the air section of a roll coating machine),

2/1/32

Summary of Results.

1. The higher the absolute humidity, the higher the tear and folds.

2. The effect of extracuring before stripping varies with the dry bulb temperature, the absolute humidity being the same. At dry bulb temperatures between 95° and 110° F. the tear increases with the time of curing. At a dry bulb temperature of 125° F. the tear decreases with the time of curing.

3. Film of slightly higher tear is produced if the temperature during the shrinking period is not too high. It is better to cure at 120°-130° F. than at 160°-170° F.

4. The lower the tension immediately after stripping the higher the tear and, in general, the lower the folds.

Discussion of Results.

Consideration of the above results has led to the adoption of the following theory:

The tear strength and, to a certain extent, the folds of a support made from any dope formula high in alcohol will be dependent on the amount of shrinking which takes place during curing.

Let us examine the above results in the light of this theory:

1. The higher the absolute humidity the higher the tear and folds. It has repeatedly been noticed that support coated at a high humidity sets to a gel very quickly and can be stripped from the plate. Such a support has a great tendency to shrink and also to overcome tension. For example, modified B-25 dope coated at a dry bulb of 112° F. and a wet bulb of 102° F., a relative humidity of 70%, gave a skin of .0061" thickness, whereas the same dope coated at a dry bulb of 110° F. and a wet bulb of 80° F., a relative humidity of 26%, gave a skin of only .0045" thickness with the same knife setting. The average tear of the former was 180 and of the latter 45. The fact that the dope coated at 70% R. H. stripped in 5 minutes, whereas the dope coated at 26% R. H. stripped in 7 minutes is further evidence that the former is inore of a gel state.

The above coatings were made as follows:

a - Dope at 110° F. was coated on plates at room temperature.

b - These plates were placed in an oven at 110° F. at various humidities.

c - The supports thus made were stripped as soon as possible and placed on a drying device which permitted the support to be further cured in a warm air oven under various tensions. This drying under variable tension was done for 15 minutes at a temperature of about 150° F. It was thought that this procedure would, in a way, correspond to the period in which the support is in the air section of a roll coating machine.

d - The support was then clamped in a wooden frame and placed in an oven at 212-225° F. for 30 minutes.

e - The support was then held at 50% R. H. at 70° F. for 12 hours before testing.

In the above tests in which thicknesses of .0061" and .0045" were reported, the tensions were as follows:

Time. Weight in Grams Suspended from the Support.

0 - 5'	200 g. + 164.5 = 364.5
5 - 10'	400 g. + 164.5 = 564.5
10 - 15'	600 g. + 164.5 = 764.5

In anticipation of the question as to the certainty of conclusions drawn from physical data of support of such different thickness, it was thought advisable to lower the tension of the support coated at low humidity in order to bring its shrinkage up to that of support coated at high humidity. (This has certain advantages over a change in knife setting which alters the stripping time markedly and thus adds new variables.) Consequently, an R. P. dope was coated at 25% R. H. at 110° F. and cured under the tension of the weight of the lower clamp and pan which was 164.5 g. However, even though this test was made with slightly increased knife setting (3-3/4 increased to 4) the shrinkage was very low, giving a support of tear #7 at .0046" thickness. The same dope coated at a knife setting of 3-3/4 but at 42% R. H. at 110° F. (which is just at the point of whiteness for R. P.) gave a support of tear #9 at .0052" thickness, when cured under the standard tension of 364.5, 564.5 and 764.5 g.

It is therefore quite certain that we have in this R. P. support coated at the higher humidity a material in a gel state which will shrink more under far greater tension and produce a better tearing support than the one coated at lower humidity and which is not, very probably, in such a gel state.

The same general tendency has been found to hold true in the case of the modified R-25 dope, only the beneficial effect of gel formation can be carried so much farther since whiteness is never encountered. In fact, support of tear 45 at .0044" thickness when coated at 86% R.H. at 110° F. to support of average tear of 150 at .0061", with some samples of tear as high as 250 at .0082", with a R. H. of 75% at 110° F. has been made with modified R-25 dope.

It is apparent then that in coating this modified R-25 dope, sufficiently high humidities must be used in order to give a gel which will counteract the lowest workable tension in the air section. The use of still higher humidities will no doubt give a better support, but their use may be limited by the maximum allowable shrinkage, and the recovery cost. It is possible, however, that the great increase in speed will offset the above.

2. The effect of extracuring before stripping varies with the dry bulb temperature - the absolute humidity being the same.

On the basis of the above theory, the explanation might be that at low temperatures the effect of extracuring is more one of gelling than of solvent loss. It is possible that there is a continual inhibition of water giving a greater gel formation and hence greater shrinkage, at higher temperatures, however, either the curing through solvent loss exceeds the gelling action or there is not the amount of inhibition which takes place at lower temperatures.

3. Film of slightly higher tear is produced if the temperature during the shrinking period is not too high.

It is quite certain that the shrinking action takes place over a period of time. Lower curing temperatures, therefore, lengthen the shrinkage period and thus allows more shrinkage to take place.

4. The lower the tension after stripping the higher the tear.

If the above theory is true, then such a support if not allowed to shrink at all should be very poor. Such is found to be the case.

C F0

Acknowledgment.

The writer wishes to thank Dr. Carver and Mr. Wynd for  
valued assistance during the course of this work.

*Ralph H. Talbot*  
R. H. Talbot,  
Dept. of Mfg. Experiments.

*Noted E.K.P.*

RHT:F.

TABULATED DATA.

1. Effect of Different Humidities on Tear and Folds, R. P. at Low Humidity.  
 (Reference: Book I, p. 287, #17)

A. Coating Data.

Type of Dope	- - -	R. P.
Knife Setting	- - -	3-3/4
Dry Bulb Temperature	- - -	107° F.
Wet "	- - -	78° F.
Relative Humidity	- - -	28-1/2%
Absolute Humidity	- - -	.018
Stripping Time	- - -	7'

B. Curing Data. - Shrinking Period.

<u>Time in Minutes.</u>	<u>Weight in Grams.</u>	<u>Temperature °F.</u>
0 - 5	800 + 184.8	140 - 150
5 - 10	400 + 184.8	150 - 165
10 - 15	800 + 184.8	160 - 188

C. Final Curing Data.

<u>Time.</u>	<u>Temp. °F.</u>
30'	212 - 220

D. Physical Tests.

Tear 48	.0045	Folds 94	.0042
		118	.0040
		109	.0038

2. Effect of Different Humidities on Tear and Folds, R. P. at High Humidity.  
 (Reference: Book I, p. 288, #23)

A. Coating Data.

Type of Dope	- - -	R. P.
Knife Setting	- - -	3-3/4
Dry Bulb Temperature	- - -	110° F.
Wet "	- - -	88° F.
Relative Humidity	- - -	42%
Absolute "	- - -	.025
Stripping Time	- - -	8'



B. Curing Data - Stripping Period.

<u>Time in Minutes</u>	<u>Weight in Grams</u>	<u>Temperature ° F.</u>
0 - 5	200 + 164.5	140 - 154
5 - 10	400 + 164.5	152 - 168
10 - 15	800 + 164.5	162 - 170

C. Final Curing Data.

<u>Time.</u>	<u>Temperature.</u>
30'	212° F.

D. Physical Tests.

Tear 80 .0052      Folds 87 .0048  
158 .0044

E. Effect of Different Humidities on Tear and Folds - Modified R-25 at Low Humidity. (Reference: Book 1, p. 283, #18)

A. Coating Data.

Type of Dope - Modified R-25 (98% #12, 2% #7, 10% #3)  
Knife Setting - - - 3-3/4  
Dry Bulb Temperature - 110° F.  
Wet " " - 80° F.  
Relative Humidity - - 28%  
Absolute " " - 215  
Stripping Time - - 7'

B. Curing Data - Shrinking Period.

<u>Time in Minutes</u>	<u>Weight in Grams</u>	<u>Temperature ° F.</u>
0 - 5	200	155 - 155
5 - 10	400	158 - 160
10 - 15	800	160 - 165

C. Final Curing Data.

<u>Time.</u>	<u>Temperature.</u>
30'	205 - 220° F.

D. Physical Tests.

Tear 45 .0044      Folds 125 .0041  
92-1/2 .0041

4. Effect of Different Humidities on Tear and Folds, Modified B-25 at High Humidity. (Reference: Book I, p. 287, #24)

A. Coating Data.

Type of Dope	- - -	Modified B-25
Knife Setting	- - -	3-3/4
Dry Bulb Temperature	- - -	111° F.
Wet "	- - -	102° F.
Relative Humidity	- - -	72%
Absolute "	- - -	.044
Stripping Time	- - -	5'

B. Curing Data - Shrinking Period.

<u>Time in Minutes</u>	<u>Weight in Grams</u>	<u>Temperature ° F.</u>
0 - 3	200 ± 164.5	170 - 180
3 - 10	400 ± 164.5	180 - 190
10 - 15	300 ± 164.5	180 - 190

C. Final Curing Data.

Time. 30'  
Temperature. 212 - 220° F.

D. Physical Tests.

<u>Tear.</u>	<u>Thickness.</u>	<u>Folds</u>
5-1/2	.0057	40 .0070
7	.0057	47 .0083
8	.0060	
14-1/2	.0062	
15-1/2	.0067	
8	.0067	
Average tear = 150	.0061	
Minimum " = 80	.0057	
Maximum " = 252	.0082	

**E. Effect of Extracuring Before Stripping - Light Tensions Used.**  
 Modified E-25 Dope.

TEMP.	% R. H.	Absolute Humidity	Time on Plate	Tear Thickness	Folds	Thickness
95°F.	70	.025	5	75	80	.0051
			6-1/2	112	89	.0055
			7-1/2	122	92	.0054
110°F.	43	.025	5	45	200	.0048
			6	54	75	.0048
			7	85	124	.0045
125°F.	27	.025	5	83	102	.0048
			6	54	85	.0042
			7	45	84	.0045

All skins placed immediately after stripping on a cardboard frame and cured 15' at 170° F. and then 30' at 240° F. They were then removed from the cardboard frame and allowed to stand at least 12 hours at 50% R. H. at 70° F. before testing.

**F. Effect of Temperature During Shrinking Period. Modified E-25. Low Temp**

**A. Coating Data.**

Type of dope	Modified E-25
Knife Setting	5-3/4
Dry Bulb Temperature	110° F.
Wet	85° F.
Relative Humidity	42%
Absolute	.025
Stripping Time	5'

**B. Curing Data - Shrinking Period.**

Time in Minutes	Weight in Grams	Temperature ° F.
0	400	118
5	"	123
10	"	130
15	"	144

**C. Final Curing Data.**

Time in Minutes	Temperature ° F.
30	240

**D. Physical Tests.**

-4-

High

7. Effect of Temperature During Shrinking Period, Modified B-25, Temp.

This test was made exactly the same as #6 except:

B. Curing Data.- Shrinking Period.

<u>Time in Minutes</u>	<u>Weight in Grams.</u>	<u>Temperature F.</u>
0 - 15	400	160 - 170

D. Physical Tests.

Tear 58	.0050	Folds 51	.0050
		55	.0046

Low

8. Effect of Temperature During Shrinking Period, Modified B-25, Temp.

(A repetition of #6)

A. Same as #6 and #7.

B. Curing Data - Shrinking Period.

<u>Time in Minutes</u>	<u>Weight in Grams.</u>	<u>Temperature F.</u>
0 - 5	200	Room to 152
5 - 10	400	
10 - 15	800	150

D. Physical Tests.

Tear 118	.0054	Folds 70	.0053
		75	.0053

High

9. Effect of Temperature During Shrinking Period, Modified B-25, Temp.

(A repetition of #7)

A. Same as #6 and #7.

B. 15' at 160 - 170.

C. 30' at 212 - 220.

D. Physical Tests.

Tear 75	.0049	Folds 80	.0051
		80	.0048

1/12/52

-8-

( )

10. Effect of Tension During Curing. Modified R-25 at High Humidity -  
Frame Dried.

A. Coating Data.

Type of Dope	-	-	Modified R-25
Knife Setting	-	-	5
Dry Bulb Temperature	-	-	88° F.
Wet " "	-	-	88° F.
Relative Humidity	-	-	100%
Absolute " "	-	-	.04
Stripping Time	-	-	5-1/2

B. Curing Data.

The support was placed in a wooden frame immediately after stripping. The frame was then placed in a warm oven and allowed to cure until the temperature reached 180° F.

C. Physical Tests.

Tear	42	.0058	Folds	72	.0060
				122	.0061
				83	.0063

The support gave a very ragged (saw tooth) tear when it was torn rapidly by hand.

Note:

Other than the tension used, this support was made in a manner which would have given excellent tear values, i. e., high humidity, low coating temperature, and low initial curing temperature.

11. Effect of Tension During Curing. Modified R-25 at Low Humidity -  
Frame Dried.

A. Coating Data.

Type of Dope	-	-	Modified R-25
Knife Setting	-	-	5
Dry Bulb Temperature	-	-	125° F.
Wet " "	-	-	100° F.
Relative Humidity	-	-	41.5%
Absolute " "	-	-	.028
Stripping Time	-	-	5-1/2'

2/2/52

**B. Drying Data.**

Support placed on wooden frame immediately after stripping.

Cured 15' at 170° F.  
" 30' " 200° F.

**C. Physical Tests.**

Tear 29 .005 to .100

Folds 26 .007

33 .008

**Note:** I have no explanation for the low folds on this support. The folds, in general, seem to be more erratic than the tears, but as they have been all quite high, no special concern has been given to the matter.

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1/2/0

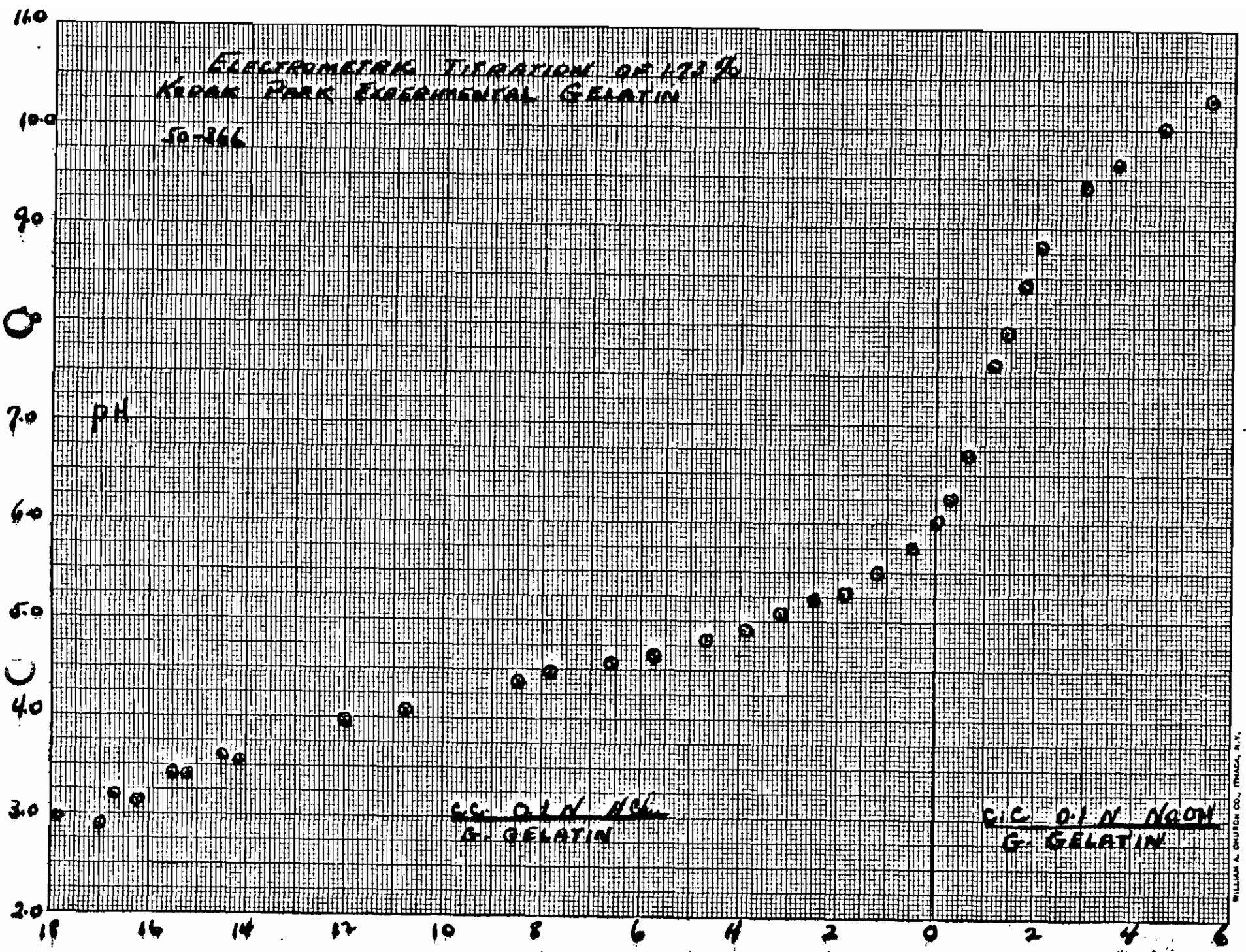
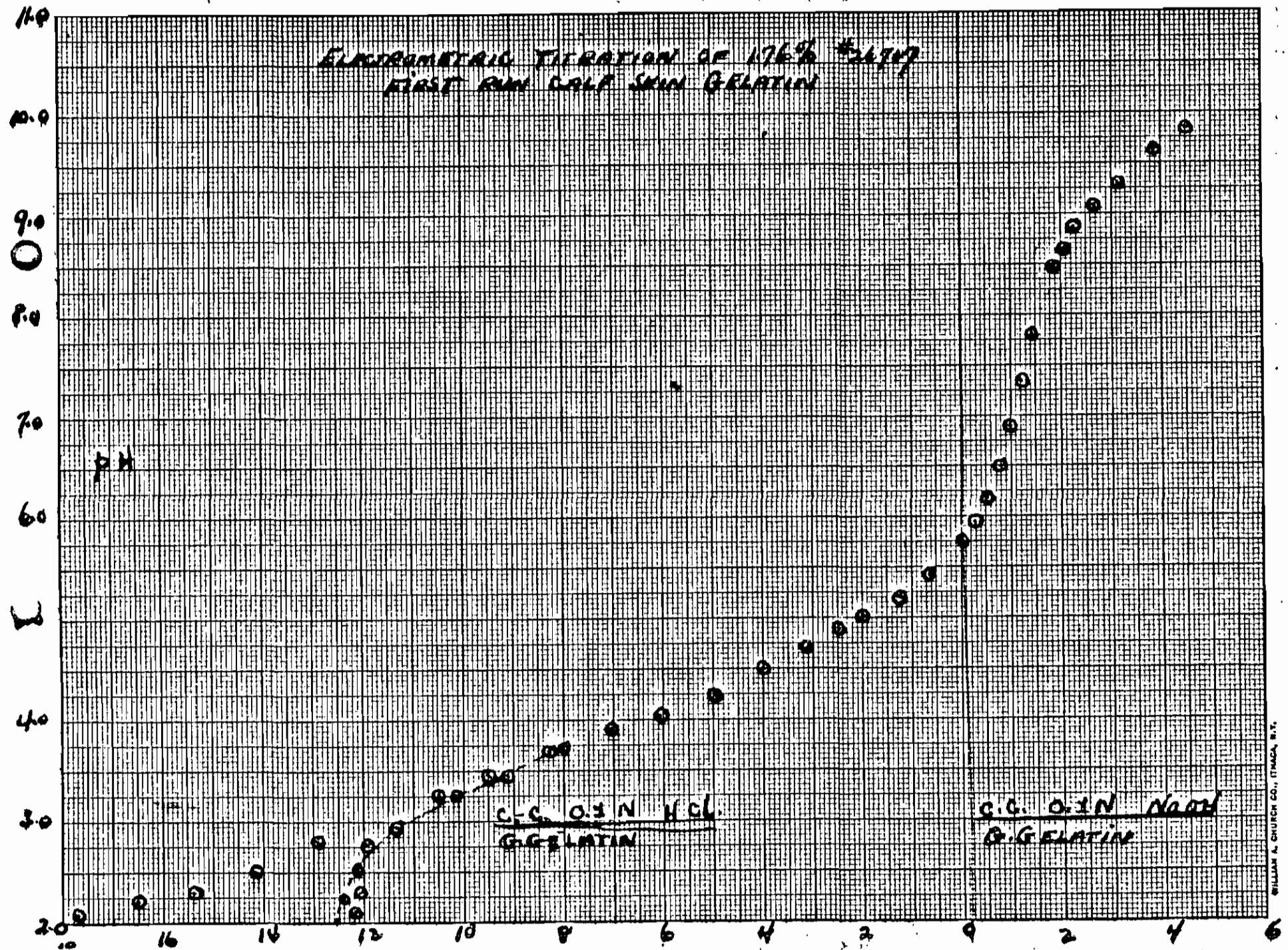
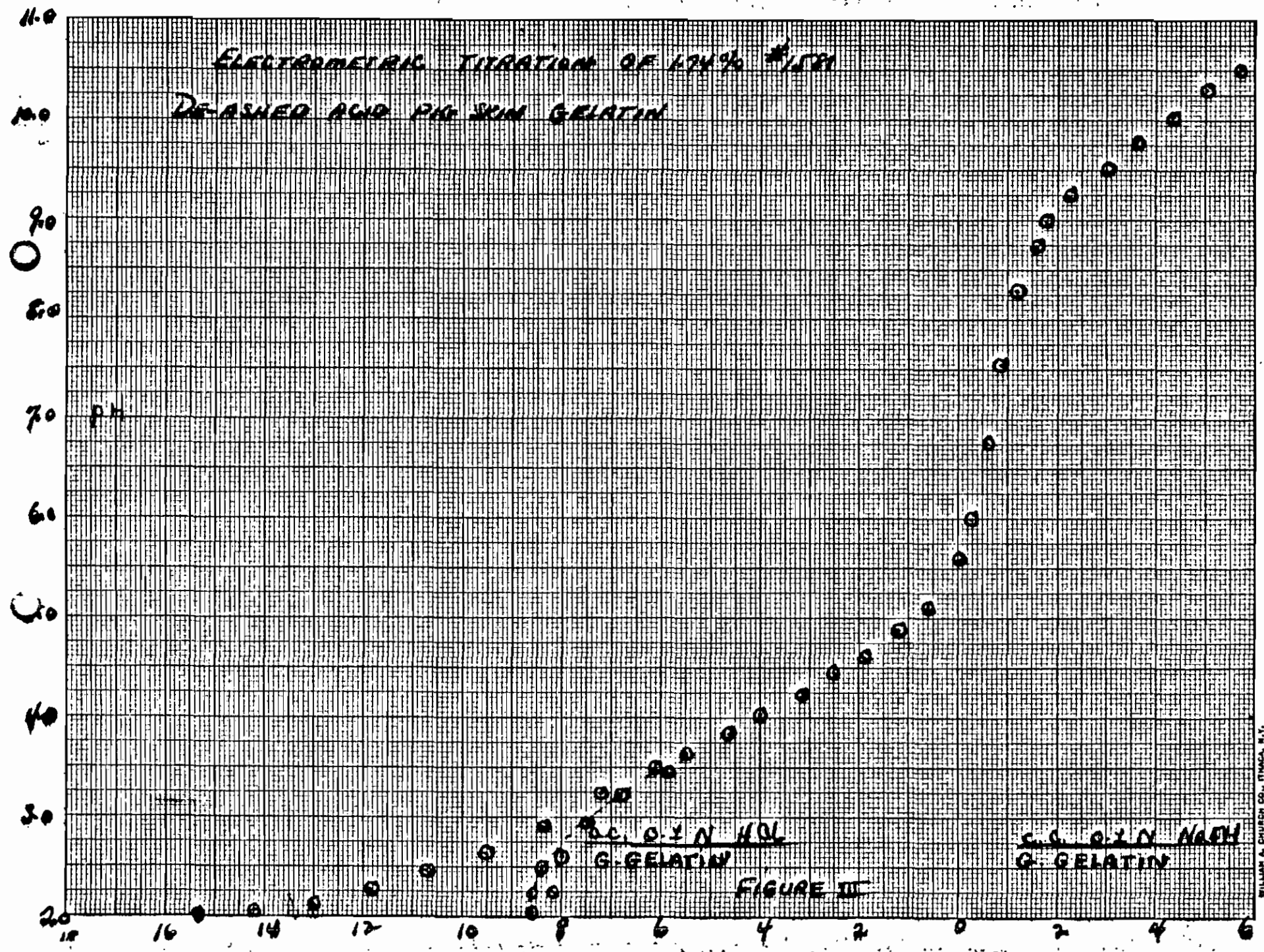


FIG I



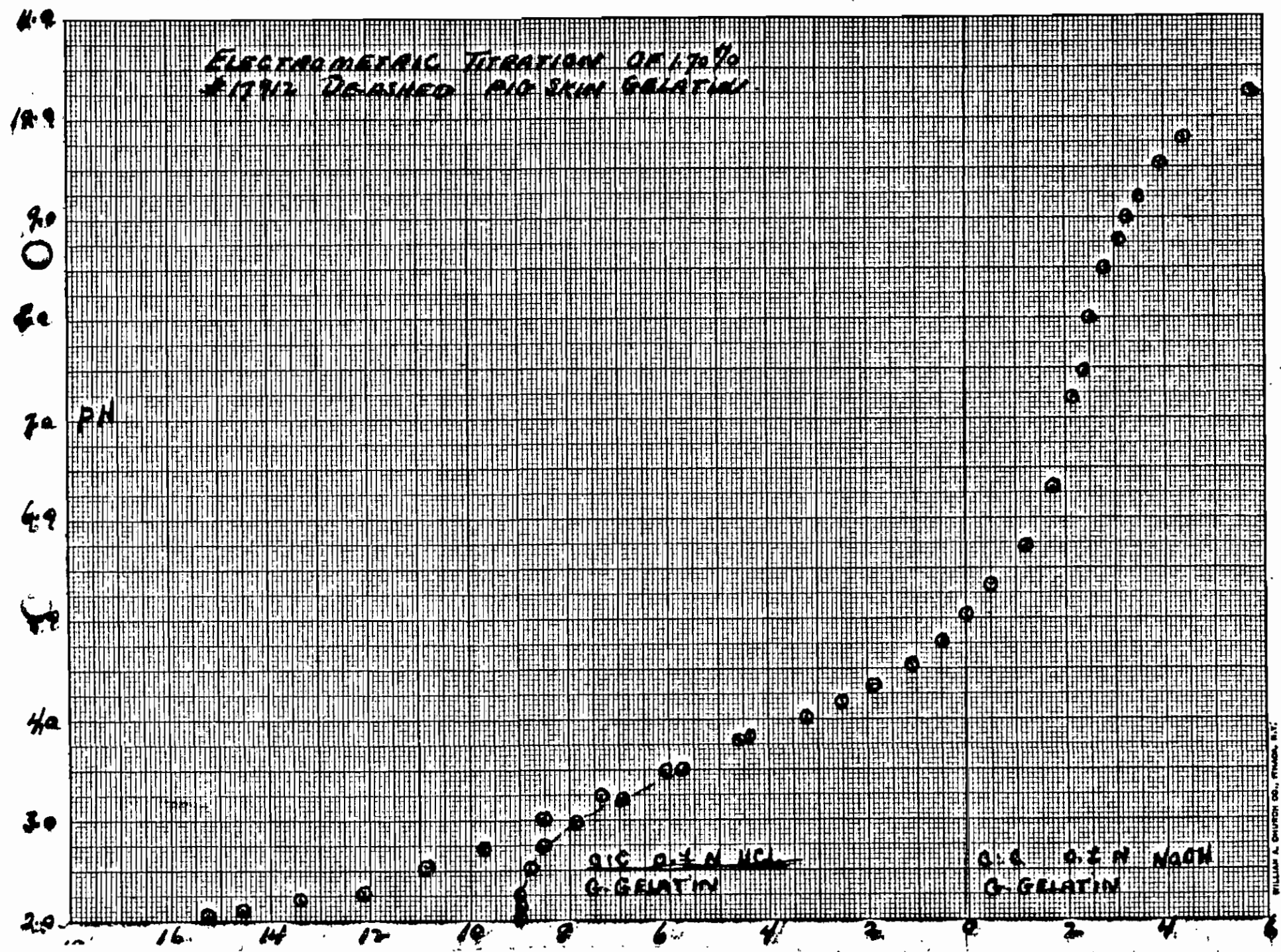
WILLIAM A. CHURCH CO., ITHACA, N.Y.



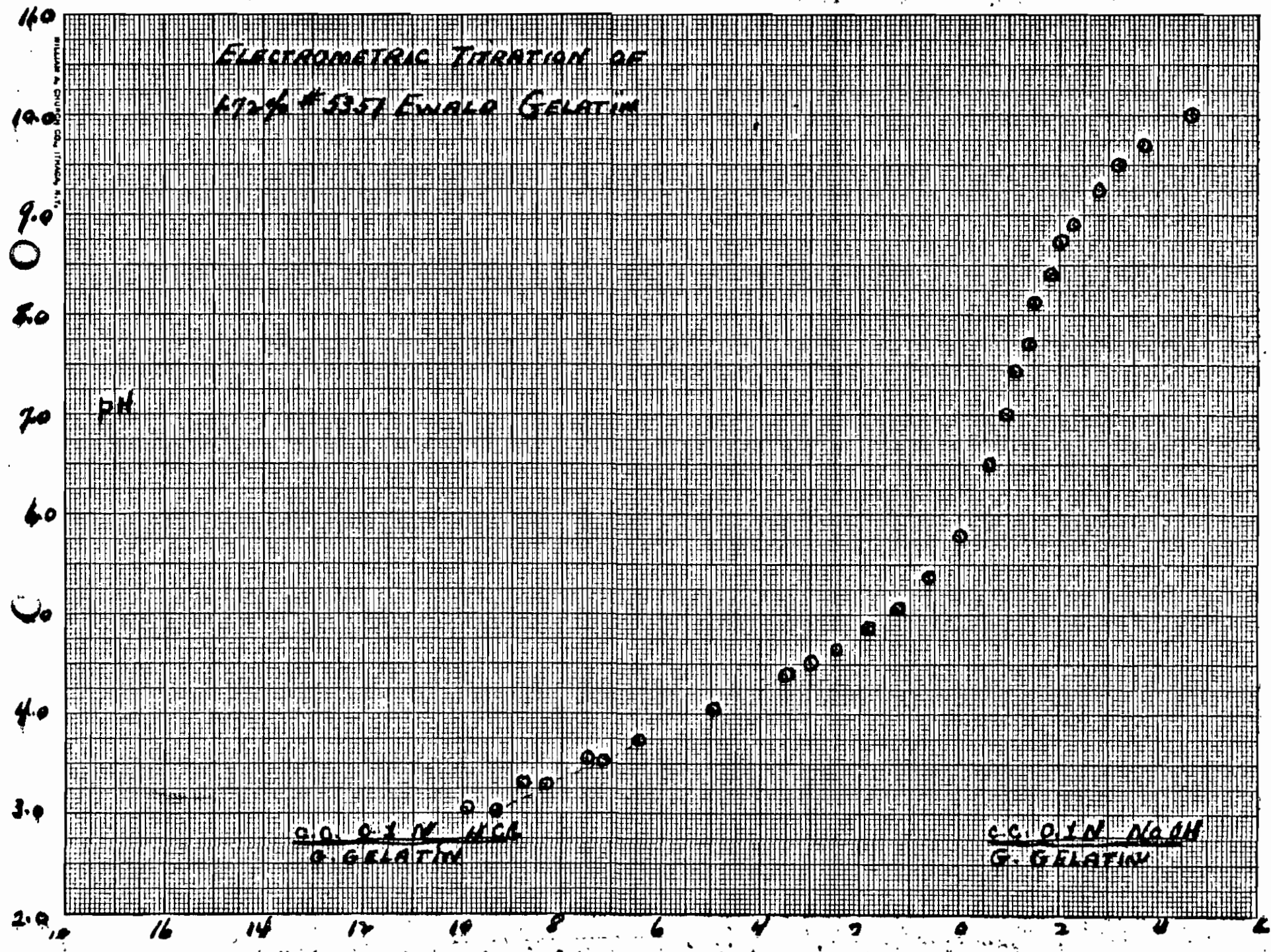


WILLIAM A. CHURCH CO., ITACA, N.Y.

ELECTROMETRIC TITRATION OF 1.70%  
 2.17% DILUTED PIG SKIN GELATIN



WILLIAM A. CHURCH CO., PITTSBURGH, PA.



R6

11.0

10.0

9.0

8.0

7.0

6.0

5.0

4.0

3.0

2.0

WILLIAM A. GUNTER CO., (INCORP. N.Y.)

# ELECTROMETRIC TITRATION OF STRESS

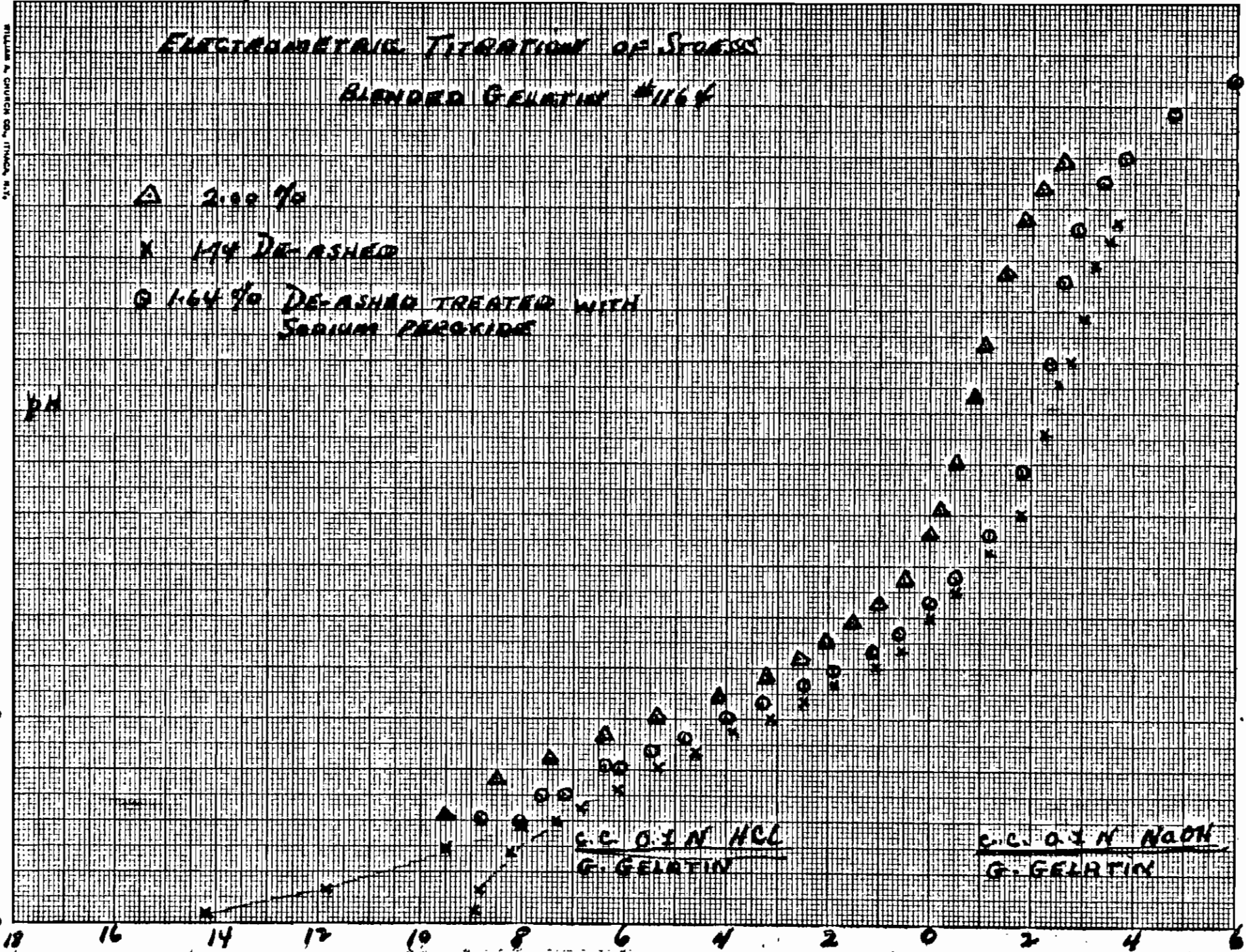
## BLENDED GELATIN #1164

- △ 2.00 %
- x 1.14 DE-ASHED
- 1.64 % DE-ASHED TREATED WITH SODIUM PEROXIDE

pH

0.1 N HCl  
G-GELATIN

0.1 N NaOH  
G-GELATIN



18

16

14

12

10

8

6

4

2

0

2

4

6

METHOD OF OPERATING MACHINES ABOVE THE UPPER

EXPLOSIVE LIMIT.

July 27, 1932.

The thermal conductivity characteristics of acetone and  $CO_2$  at high concentrations have been determined, as shown in the accompanying tri-linear chart. From this chart it is possible to determine the deflection caused by any possible mixtures of acetone and  $CO_2$  in air. The reference side of the thermal conductivity cell was filled with dry air; all this was done with a water jacket temperature of  $99^\circ C$ . Along the acetone scale we also put saturation temperatures. Along the deflection axis we have put three scales; we have decided to use the lower scale. This scale starts at 100 and the addition of either acetone or  $CO_2$  reduces the reading.

To calibrate the gas analysis system, dry air is first passed through both sides of the cell. The cell is balanced under these conditions with the mechanical zero of the recorder at 100. Pure  $CO_2$  is now passed through the analyzing side of the cell. The cell is so adjusted that this gives a reading of 51. The cells are now calibrated and ready for use.

There is a shaded area in the lower left-hand corner. This area indicates the mixtures of acetone and  $CO_2$  in air which are explosive. The machine must be operated at all times at concentrations outside of this area. There are three curved lines, one starting from 30, one from 40, and one from 50, and converging at 100% acetone. These lines indicate the mixtures of acetone -  $CO_2$  in air which would be obtained if  $CO_2$  is added to the system until either 30, 40 or 50% was present, and then acetone is added, assuming no infiltration of air. In the actual operation of the machine, we believe the composition will start and go rather rapidly up one of these curves and then slowly taper off to the acetone axis.

On the lower deflection curve, you will notice that a reading of 75 is obtained if the right-hand extremity of the explosive area is extended down to the deflection axis. This point has been taken as in the present operation of Roll Coating machines a reading of 75 indicates the explosive condition. Thus, this scale corresponds exactly to the present scale used, in that a reading above 75 may be explosive. Extending this scale, a reading of 72, which is the shutdown limit, is 10% away from the explosive area, and a reading of 67, which is the operating limit, is 30% away from the explosive area. Thus, if a recorder is used which normally has its mechanical at 100 instead of 0, the readings will correspond to the present practice in the Roll Coating Department. We can then operate the machine at all times below a reading of 67.

Thus, to start up a machine,  $CO_2$  should be added to the system until a reading of 67 is obtained. After this, coating can be started at any time, and as long as the reading is below 67 there is no danger. If a

reading between 57 and 72 is obtained, either the water temperature in the condensing coil should be raised or some other means taken to increase the concentration of acetone. If a reading of 72 is obtained, I believe CO<sub>2</sub> should be added to the machine to reduce the reading.

If the machine is shut down by adding CO<sub>2</sub>, the concentration of CO<sub>2</sub> must be raised so that it is eight times the concentration of acetone. If this condition is met, an explosive mixture cannot be obtained by diluting this mixture with air. Thus, if the machine had been running and all the CO<sub>2</sub> had leaked out and a concentration of 30% of acetone was present, we would have a reading of about 48 on the recorder. This reading would have to be decreased to 32 to be sure that the 8-1 ratio of CO<sub>2</sub> acetone had been obtained. This would give us a mixture of 10% acetone and 80% CO<sub>2</sub>. However, if a very much larger volume of CO<sub>2</sub> was added, the reading could not go beyond 31. The conductivity of this mixture varies so slowly in this region that it would be very hard to be certain that the proper point had been reached, and it would probably be necessary to add a very large excess of CO<sub>2</sub>. It may be possible to determine roughly how much CO<sub>2</sub> is necessary by the amount necessary to start the machine, i. e., in starting a machine it is going to be necessary to have at least 48% CO<sub>2</sub> present. Thus it appears that you would have to add 2-1/2 to three times the amount of CO<sub>2</sub> in stopping a machine as was used in reducing the original reading from 100 to 67. However, if the machine is being stopped and only 30% acetone is present in the machine, it would only be necessary to increase the reading from 65 to 40. On the other hand, if the original concentration of 70% acetone is present, it is going to be impossible to determine from the recorder when enough CO<sub>2</sub> has been added, due to the fact that the thermal conductivity of the increased concentration of CO<sub>2</sub> is almost exactly balanced by the decrease in thermal conductivity due to the reduction in concentration of acetone.

By far the simplest way to shut the machine down is to spray water in the circulating air casing. This would very quickly reduce the acetone vapor concentration in the gas mixture and would also effectively wash out any liquid acetone. However, it would still be necessary to increase the CO<sub>2</sub> content to 40% to be sure that some of the gas would not go through in an explosive condition in being scrubbed from a high concentration to a low concentration of acetone.

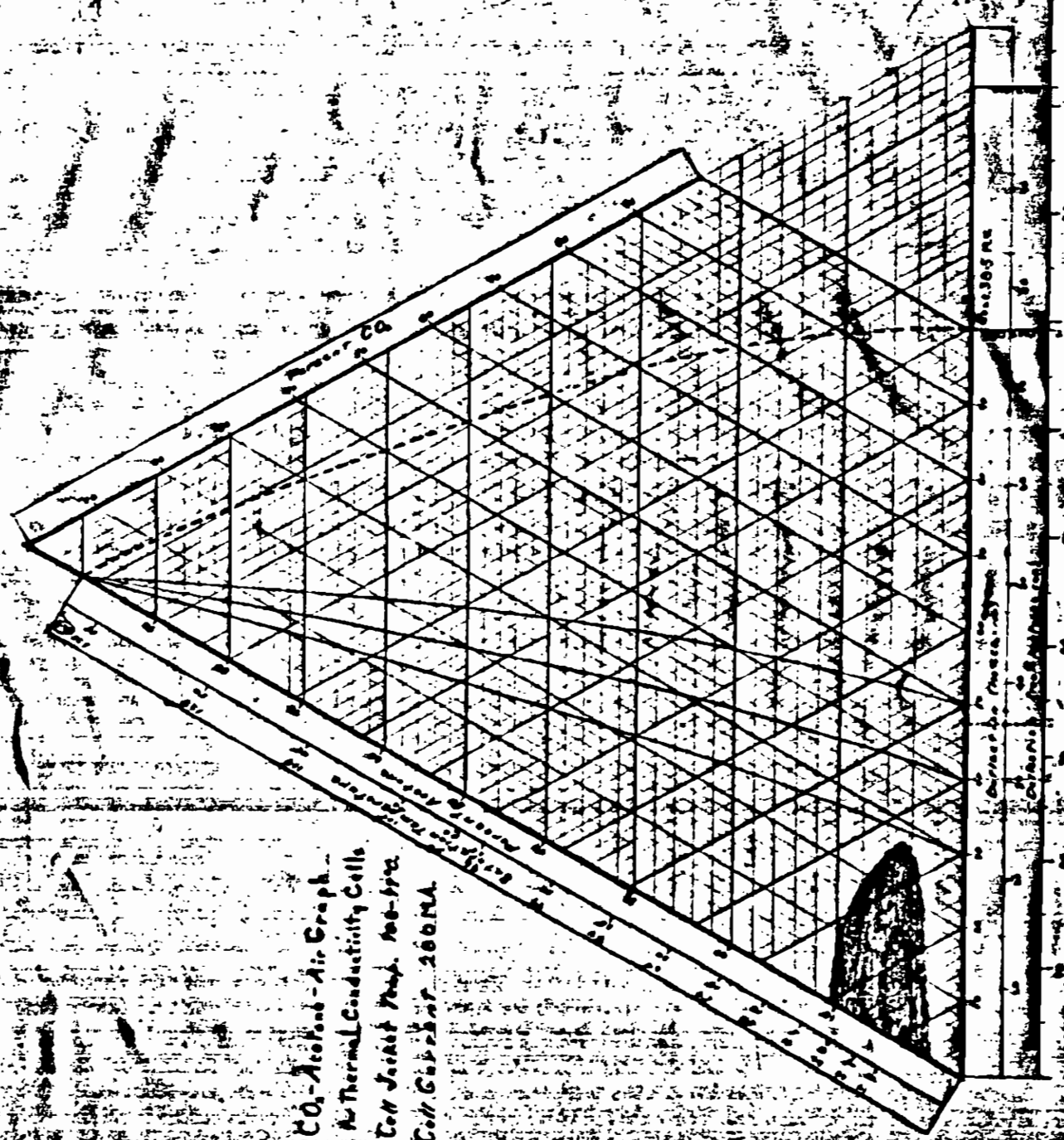
After this machine has been operated once or twice, I believe it will be possible to write very much more definite instructions for the shutting down of the machine.

*Harold W. Crouch*  
HAROLD W. CROUCH.

HWC:TV

cc to Mr. Seel, Mr. Wells,  
Mr. Van Derhoef, Mr. McKibben,

CO<sub>2</sub> - Alcohol - Air Graph  
As Thermal Conductivity Cells  
Cell Jacket Temp. 100-150°C  
Cell Current 200 MA



100 MA

SEP 29 1933

MINUTES OF MEETING

to

DISCUSS CHANGE TO LOW VISCOSITY LINTERS FOR R. P. COTTON.

September 27, 1933.

Present: Messrs. Maltman, McKibbin, Wells, Volwell, Talbot, Kimmel, and Carver.

According to Mr. Talbot's report of September 1, 1933, a low viscosity linters can be used for preparing R. P. cotton which will give a yield considerably better than that of the linters used at present. We have been unable to find any differences between this nitrocellulose and the regular R. P. nitrocellulose. The saving involved should be considerable, and once we have changed to this type of nitrocellulose, we should be enabled to go to a still higher alcohol solubility with lower acetone content and higher speeds on the R. P.

The meeting was called to discuss the best means of going to the low viscosity linters. The first question was whether or not to gradually introduce some of the nitrocellulose made from this into the regular R. P. system and continue the change if no trouble is encountered until the entire change is made. It was agreed that this was not feasible, because in the past, when changes have been made in this way, every irregularity has been blamed on the change and we have never been able to get a change through this way, due to the fact that irregularities always seem to creep in. It was agreed that it was desirable to start with the new dope in a system coating continuously on one machine until the change has been approved, after which all machines could be changed to this type of dope.

Owing to the fact that Mr. Gunderson has 200 rolls back ordered on R. P., it seemed hopeless to withdraw a machine from regular production on this material. It was, therefore, agreed to change #35 machine so that it could run R. P., then put #25 machine on #2 System and coat R. P. on it, and take #44 machine, running on 4-B System for the experiment. This would not slow up the regular production of R. P. and would, if the experiment is successful, lead to a considerable increase in output of R. P.

A further argument in favor of changing #25 machine to coat R. P. is that with all the R. P. machines operating, we are still

*U. P. 10/10*



unable to build up any stock, and if nine machines are necessary to keep even with the demand, it is highly desirable to have one extra machine for a spare.

20,000 lbs. of Hercules 20" linters are available and the nitration can be carried on at any time. It was agreed to run bean pot tests at first, and then build up a stock of wet cotton to take care of the startup. It was agreed to use the 18-change wash.

If everything goes satisfactorily, it is expected that practically all of the support can be sold as film, although it would not be relinquished until incubation tests, wear and tear tests, etc. have been made.

If, by the time we start the experiment, production should rise to a peak, it would mean a slight difficulty in dehydration, since they would not be able to dehydrate as fast when filling a single system as they could when they are filling two systems. This difficulty can always be overcome by a small amount of extra time and is not inherent in the cotton but merely in the experiment.

*E. K. Carver*

E. K. CARVER.  
Dept. of Manufacturing Experiments.

EXC:F.

Copies to Mr. Seel and to those present.

REPORT N° V. 1-185

Classification  
Problem N°

*Small note  
Mr. Dutys*

REPORT ON  
IMPROVED KODATRACE

By

Mr. A. LANDUCCI.  
Vincennes Factory

Date : March 21 st 1935

KODAK-PATHE  
VINCENNES  
FRANCE

# REPORT N° V. 1. 185

LA BIENNE  
INDUSTRIE DE LA BIENNE  
PARIS 18  
INDUSTRIE DE LA BIENNE  
PARIS 18  
INDUSTRIE DE LA BIENNE  
PARIS 18  
INDUSTRIE DE LA BIENNE  
PARIS 18  
INDUSTRIE DE LA BIENNE  
PARIS 18

A. LANDUCCI  
Vincennes Factory

Report No. 59  
March 21st 1935

## IMPROVED "KODATRACE"

### COATING, DEACETYLATING AND MATTING OF THE FILM -

In order to increase ink adhesion and avoid spreading, attempts were made to alter the surface of Kodatrace in such a way as to produce thereon a thin layer of cellulose obtained by total or partial deacetylation of the acetate with which the film is made.

This deacetylation is obtained by means of an alcoholic sodium hydroxide solution and after the following consecutive operations:

A cellulose acetate film 8/100 m/m thick is coated according to a formula corresponding to that of our standard acetate castings, that is, plasticized with 30% triphosphates.

The wheel is run at a speed which depends upon the diameter of the matting cylinder but it must be such that contact of the film with that cylinder lasts no less than one minute.

In subbing cabinet (a) - see enclosed sketch - the film is dipped in the deacetylating solution composed of ethyl alcohol 70° containing 5% sodium hydroxide lye at 40°B°.

Upon leaving the subbing cabinet and without touching any cylinder on the deacetylated face, the film passes into the second subbing cabinet (b) where matting is effected in the following way:

The film is applied by means of rubber cylinder (c) on matting cylinder (d) from which it is stripped by another rubber cylinder. The matting cylinder is driven at a suitable speed and heated at a temperature ranging from 40 to 60°C. Nozzle (f) sprays between cylinders (c) and (d) a solution composed of 1% sodium hydroxide lye and 2% rosin in 70° ethyl alcohol which, when warm, is a good swelling agent of cellulose acetate and has an attacking power sufficient to ensure matting.

The film then passes into the third cabinet (g) where the other side is either tinted or deacetylated. Deacetylation of the polished side is effected for certain customers who sensitize Kodatrace with diars dyes.

The film then enters into drying section (h) where deacetylation continues under the action of heat (temperature 60°C), and is sent into tank (i) where it is washed with running water so as to eliminate all traces of lye. Five minutes in the pan is sufficient to remove any excess of sodium hydroxide.

Finally, the film passes into the last drying section where drying is completed.

#### TESTING OF KODATRACE

The best method which we have found for testing Kodatrace consists in tracing with India ink a series of lines of different thicknesses, then filling the drawing-pen with an equal quantity of ink and applying it vertically on the film during various lengths of time, for instance, 5, 10 and 15 seconds.

The size of the spots is examined and once the ink is dry the degree of adhesion is tested with the finger nail. Moreover, examination of the lines shows whether the too rapid spreading of the ink on the film produces differences in the thickness of the line, notably at the extremities.

#### PREPARATION OF MATTE CYLINDERS FOR THE MATTING OF KODATRACE

In order to obtain an even matting, it is essential to use adequate matting cylinders, the preparation of which is summarized hereunder:

Steel rollers of the required size are carefully polished by means of a device called a "tank" which has a strip of abrasive cloth (Nos 100, 150, 200 or 300) stretched over two cylinders one of which is driven by an electric motor.

They are then burnished on a lathe with cotton felt disks and an abrasive paste of tallow and colcothar until perfectly smooth. All marks made by the abrasive cloth must be carefully removed.

After the rollers have been thinly nickel plated under the following conditions

Time of deposit: 2 hours

Temp. 5 p. r. da<sup>2</sup>

they undergo an acid copper plating until a thickness of 20/100 m/a is reached, and are then polished lengthwise, by hand, with fine 000 emery paper until a perfect surface is obtained.

The rollers are then nickel plated 2/100 m/a thick; when they return, one third of their total surface dips in the bath.

Time of deposit: 15 hours - 5 amp 5 per dm<sup>2</sup>

They are finally burnished on a lathe until a perfect surface is obtained.

#### Matting -

The rollers are matted according to the method described in Report No. 34 and which we resume hereunder:

A roller is mounted on a lathe which drives it at a linear speed of 22 metres per minute. The slide rest of the lathe holds a "tank" which has a strip of abrasive material No. 120 stretched over two cylinders, one of which - as explained above - is driven by an electric motor mounted on the slide-rest. The speed of the slide-rest is 10 m/a per minute. It will be readily understood that when the abrasive band is driven by that motor at a linear speed much greater than that of the cylinder, it grinds the nickel plated surface giving it a finish which varies with the grain of the abrasive cloth used. But if the motor is disconnected and the idle band allowed to press on the roll in such a way that it is driven by it, each grain of the abrasive cloth will print on the nickel plated surface, and, after a certain number of runs (about 12, each lasting about two hours and a quarter), a uniform dull finish will be obtained.

A list of the usual defects encountered are given hereunder, together with their respective remedies:

#### 1° - Shifting of the abrasive cloth due to:

a) - Elongation of the cloth after it has been used for some time -

This is avoided by increasing the tension of the cloth when the machine is stopped.

b) - Pressure against the steel roller -

The lesser speed of the tank partly decreases this defect. The roller on which the abrasive cloth passes and which presses against the cylinder was formerly composed of felt disks which wore down rapidly and gave uneven pressure; they were therefore replaced by a rubber roller which prevents the cloth from shifting about, thus avoiding defective areas.

#### 2° - Mottled Areas:

distances as to be

due to a gear which drives the spindle. By using a gear box which reduces the speed of the runs, these areas are not so apparent but still exist. Five or six runs by hand at the irregular speed of 20 to 30 r/m per minute generally give the required result, but it is essential to use an irregular speed.

5° - Very Fine Fluting Streaks producing on the finished film shiny streaks of irregular lengths. This defect may be due to:

a) - the rubber cylinder which does not allow the abrasive cloth to turn freely. The bearings must be lubricated and the cloth stretched carefully.

b) - small streaks remaining after burnishing owing to defective polishing. A perfectly polished surface must be obtained. If required, the roller should be sand-blasted finely before nickel plating, and then well burnished after plating.

When a run is started, neither the tension of the cloth nor the pressure against the roller should be changed.

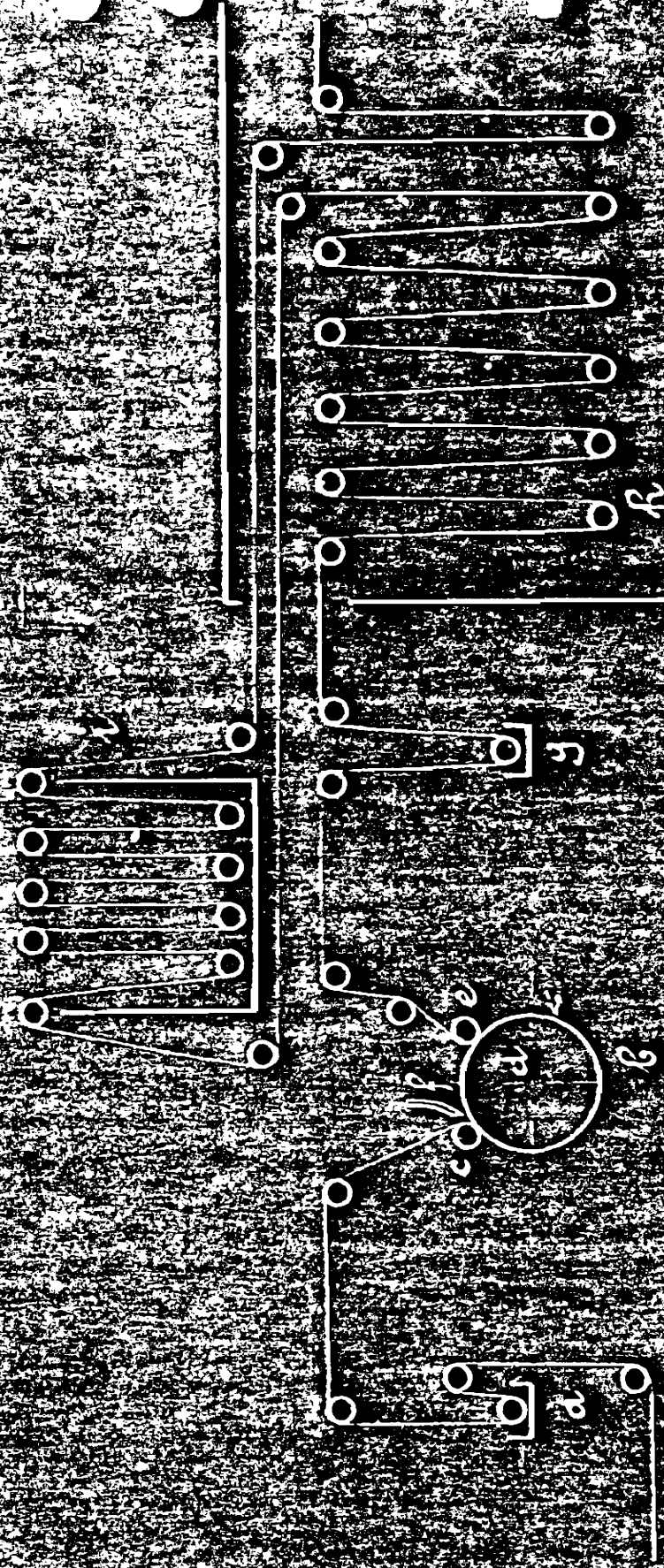
Should some modification have to be made owing to exaggerated elongation or shifting of the cloth, spots, etc. the lathe must be completely stopped. The necessary adjustments are then made and the next run started from the beginning.

Dust and spattering of oil on the cylinder must be avoided as such defects are very difficult to eliminate from the grain afterwards.

*A. Landucci*  
A. LANDUCCI

Installation required for coating improved Kodakware

See Mr. Sanchez's report no. 59



November 20, 1935

PROPOSED CHANGE IN WINDUPS FOR MACHINES LOCATED IN BLDG. 20

The conference which was held on Wednesday, November 21, was attended by the following:—Messrs. Seel, VanDerhoof, Carver, Balls, Wynd, Davidson, Fox, Webb, Paddock, Young, Babcock, Hadeau, M. Davis, and H. F. Smith. The following is a brief summary of the decisions reached in the conference:

A change in the design of windups for machines in Bldg. 20 has been considered several times during the past few years. Over two years ago a design for a new type windup was made for machines in Bldg. 20 but no action was taken at that time. Since the need for an improved windup is recognized, it will be necessary to prepare a revision of the original design. The revised design will incorporate all the improved features of the windups in Bldg. 25.

Because the original design did not provide for knurls and because of the need for provision for inspection, it will be necessary to rearrange the assembly.

The following changes must be made in the original drawing:

1. A change must be made in the location of the slitters.
  2. Knurls are to be located between dryers and tension rolls.
  3. Tension rolls and oil friction drive must be located.
  4. Provision must be made for a double roll windup.
  5. Tension on the windup core is to be controlled by a Siphon Control.
  6. Provision must be made to facilitate inspection. Consideration must be given to the angle of the support from perpendicular, and to the background against which inspection will be made. This will mean that the tension rolls must be moved back and raised to provide proper angle for inspection and to permit double roll assembly.
  7. Lighting effects must be studied to improve inspection, and to eliminate present fire hazard.
  8. Conveyor track must be run to windup to provide for removing rolls. Present type manual cranes for removal of rolls will be eliminated.
  9. Path of support through windup, as regulated by windup position of core and rolls, must permit freedom for gauging the thickness with a hand gauge.
  10. Provision should be made for a possible change to the P.I.V. Drive. The design should incorporate provisions for making such a change. On all drum type machines or machines having positively driven drums near the windup, oil friction drives will be used to drive the tension rolls. On machines of the air section type having large numbers of idle rolls, the P.I.V. Drive is to be used for tension rolls.
- Mr. Seel stated that the Cine Positive Machines should be equipped first. The proposed change will provide for the installation of the new type windup on Machines 34 to 42 inclusive, 45, 52, and 54.

It is also proposed to incorporate improvements in the windup of 43 and 44



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Machines. On these machines the P.I.V. Drive will be used for the tension rolls in the windup and a Siphon Tension Control will be provided for the winding assembly. The location of the rolls on #44 Machine must be changed to permit gauging with ease and safety and to provide for ease of inspection.

To justify the proposed changes, Mr. VanDerhoof is to obtain an estimate of the cost of the new type windup from Col. Brown and Mr. Bakberg. Mr. VanDerhoof agreed to make a request for the estimate on Friday, November 22.

In addition to the consideration of the change in design of the windups, consideration was given to air circulation and to widening the machines in anticipation of future requirements.

Mr. Wynd requested that provision be made for more air in the front air section.

The method of heating the wheel was discussed. Some criticism was offered against the coil heated wheel. A preference was expressed for the Air-fin type heater which is located outside the wheel. This type of heater is used on #45 Machine.

A statement was made that coils have been made for the wheels of #3, #31, and #32 Machines. The provision of coils for the wheels of #31 and #32 Machines is unnecessary. Mr. Davis is to investigate to determine whether the design calls for coils in these machines and whether coils have been made for these wheels. Even though coils are made they should not be installed in view of the consensus of opinion in favor of externally heating the wheel with the Air-fin type heater.

Mr. Seel suggested that consideration be given to widening the wheels in anticipation of our requirements in the near future. Mr. Davis is to prepare an estimate of the cost of widening the machines.

Dr. Carver is to request an estimate of the possible saving effected by coating wider widths as justification for building wheels and machines wider. Dr. Carver is to arrange with Mr. Kinsella for this estimate. Mr. Paddock stated that the justification for the wider machines would probably be based on procuring two more cuts out of each roll of Cine. He anticipates that eventually still wider widths would be coated which would increase the saving to be effected.

A conference is to be held on Tuesday, November 26, at 9 A.M. in Mr. VanDerhoof's office. Mr. Davis is to present an estimate of the cost of windups and an estimate of the cost of widening wheels and widening machines. Dr. Carver is to present an estimate of the saving to be effected by coating wider support which estimate will be furnished by Mr. Kinsella. Consideration will be given at this time to the heating of the coating wheel and air circulation within the machine. This conference is to be attended by Messrs. Carver, Wynd, Wells, Hadeau, Davis, Merrill, Davidson, Fox, Webb, L.D. Jackson, and H. J. Smith.

Smith/FP

Messrs. Seel, VanDerhoof, Carver, Wells, Wynd, Davidson, Fox, Webb, Paddock, Young, Babcock, Hadeau, Mr. Davis

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8 8

CHEMICAL PLANT

KODAK PARK

December 19, 1935

Mr. E. R. Taylor, Bldg. 46.

Subject: Analyses of Solvent Mixtures of  
Butyl Alcohol, Ethylene Dichloride,  
and Propylene Dichloride

When ethylene dichloride was first used widely as a solvent, its principal contamination was butyl alcohol in amounts varying from about 5% when used in a dope formula to 1% or less when recovered.

The analysis of such a mixture, that is, ethylene dichloride and butyl alcohol was not difficult. The Chemical Plant Laboratory devised a specific gravity curve for mixtures of the two. This curve was entirely adequate for some time. The Industrial Laboratory adopted an analytical procedure based on a saponification reaction.

Both methods had certain faults. An analysis by specific gravity was always faulty because the exact specific gravity of ethylene dichloride itself is debatable even now. Three years ago the best ethylene dichloride obtainable was about 1.253 in specific gravity. Samples more recently are about 1.256, while some have been reported to be as high as 1.258. Obviously, an analysis by specific gravity is open to criticism. The analysis by saponification reaction is open to less criticism from a theoretical point of view. Yet the percentage of error usually encountered makes the quantity of butyl alcohol, as obtained by difference, very questionable.

More recently, propylene dichloride is suspected of being a common constituent of recovered ethylene dichloride. Both methods naturally fail when applied to such a solvent combination.

For these reasons, particularly the latter, we have recognized that our tests on recovered ethylene dichloride have been inadequate and inaccurate. Until of late, there were no simple methods of analyzing such mixtures.

I am submitting for consideration a method by which we can determine butyl alcohol directly, employing the recently developed acetyl chloride - pyridine method (see report of Oct. 8, 1935). We then can calculate the amount of propylene

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dichloride in a mixture with ethylene dichloride. Our estimated accuracy for butyl alcohol up to amounts of 5% is  $\pm .03\%$ . An error in determination of butyl alcohol is relatively serious because the error is approximately tripled with respect to propylene dichloride. If an error is made in obtaining a specific gravity of a sample, the effect is noticeable and makes the amount of propylene dichloride further in error. Of course, the errors are additive in some cases, compensatory in others.

Herewith is presented the data collected in devising the new analytical method. A comprehensive discussion of limitations and criticisms is given.

### I. Specific Gravity - Concentration Curves

We obtained samples of ethylene dichloride, propylene dichloride and butyl alcohol of the following specific gravities:

Ethylene dichloride	1.2562	20/20°
Propylene dichloride	1.1595	20/20°
Butyl alcohol (Redistilled)	0.810	20/20°

The specific gravities agree with the most reliable information on these materials.

Curves were made from data as follows:

TABLE I

#### Ethylene Dichloride and Propylene Dichloride

##### Quantities Used

<u>Propylene Dichloride</u>	<u>Ethylene Dichloride</u>	<u>% Propylene by Volume</u>	<u>Dichloride by Weight</u>	<u>Specific Gravity 20/20°</u>
5 cc	495 cc	1%	0.92%	1.2551
10 "	490 "	2%	1.85%	1.2541
15 "	485 "	3%	2.78%	1.2533
25 "	475 "	5%	4.63%	1.2514
35 "	465 "	7%	6.50%	1.2494
50 "	450 "	10%	9.30%	1.2467

TABLE I (Cont'd.)

Ethylene Dichloride and Butyl AlcoholQuantities Used

<u>Ethylene Dichloride</u>	<u>Butyl Alcohol</u>	<u>% Butyl Alcohol</u>		<u>Specific Gravity 20/20°</u>
		<u>by Volume</u>	<u>by Weight</u>	
495 cc	5 cc	1%	0.65%	1.2517
490 "	10 cc	2%	1.30%	1.2468
485 "	15 "	3%	1.96%	1.2420
475 "	25 "	5%	3.28%	1.2326
465 "	35 "	7%	4.63%	1.2232
450 "	50 "	10%	6.69%	1.2099

The procedure for making up these solutions was: A 500 cc. volumetric flask was filled to the mark with the principal solvent, ethylene dichloride at 20°C. A pipette was used to remove a certain quantity, making certain, however, that the pipette contained the customary residual quantity. The same pipette was used to add an identical amount of the other solvent; that is, either propylene dichloride or butyl alcohol.

We recognize that formulation of solutions by pipettes is not above criticism, inasmuch as pipettes are calibrated to deliver and not to contain certain amounts of liquids. Our curves, therefore, are in error to the extent that a pipette might deliver more or less of a solvent than it would with respect to delivery of water. We believe such errors are, in this case, trivial.

II. Standard Solutions Containing Butyl Alcohol

Solutions were made up as described in Table II.

TABLE II

	<u>Original Solution Speci- fic Gravity 20/20°</u>	<u>Propylene Chloride in Original Solution (By Wt.)</u>	<u>cc of Orig- inal Solution Used</u>	<u>cc Butyl Alcohol Added</u>
1.	1.2541	1.85%	250 cc	5 cc
2.	1.2514	4.63%	250 "	5 "
3.	1.2467	9.30%	250 "	5 "

	<u>Specific Gravity Found 20/20°</u>	<u>Theoretical Analysis</u>		
		<u>Ethylene Dichloride By Weight</u>	<u>Propylene Dichloride By Weight</u>	<u>Butyl Alcohol By Weight</u>
1.	1.2446 20/20°	96.89%	1.83%	1.28%
2.	1.2419 "	94.15%	4.57%	1.28%
3.	1.2374 "	89.32%	9.18%	1.30%

III. Analysis of Solutions

In order to test the accuracy of our proposed analytical method, the above data would be sufficient. Actually the three solutions were tested for butyl alcohol content and found to contain 1.27%. This figure represents our precision of approximately  $\pm 0.03\%$ . We used 1.27% to calculate the analyses as in Table III.

TABLE III

	<u>Solution 1</u>	<u>Solution 2</u>	<u>Solution 3</u>	<u>Solution</u>
(1) Butyl Alcohol (found)	1.27%	1.27%	1.27%	1.30%(Assumed)
(2) Specific Gravity of solution of Ethylene Dichloride with Butyl Alcohol as found (from curve)	1.2467	1.2467	1.2467	1.2466
(3) Specific Gravity of Solution	<u>1.2446</u>	<u>1.2419</u>	<u>1.2374</u>	<u>1.2374</u>
(4) Drop in Specific Gravity due to Propylene Chloride (2) - (3)	0.0021	0.0048	0.0093	0.0092
(5) Specific Gravity of Ethylene Dichloride minus drop due to Propylene Dichloride	<u>1.2562</u> <u>.0021</u>	<u>1.2562</u> <u>.0048</u>	<u>1.2562</u> <u>.0093</u>	<u>1.2562</u> <u>.0092</u>
	<u>1.2541</u>	<u>1.2514</u>	<u>1.2469</u>	<u>1.2470</u>
% Propylene Chloride in mixture of Propylene Chloride and Ethylene Dichloride (from curve)	1.85%	4.62%	9.10%	9.00%
Known total of Propylene Chloride and Ethylene Chloride	98.73%	98.73%	98.73%	98.70%
x Propylene Chloride (98.73 x 1.85%) =	1.83%	4.56%	8.99%	8.89%

Since by determining butyl alcohol directly and using the quantity found to determine the effect of it in causing a drop in specific gravity of ethylene dichloride, we expect to arrive at the specific gravity of the mixture of ethylene dichloride and propylene dichloride of the sample under test. We can do this quite accurately as shown in Table IV.

By reference to Table III, we find data for Table IV.

TABLE IV

<u>Solution No.</u>	<u>Known Specific Gravity of Propylene Chloride and Ethylene Dichloride in solution</u>	<u>Calculated Specific Gravity from determination of butyl alcohol as 1.27%</u>
1	1.2541	1.2541
2	1.2514	1.2514
3	1.2469	1.2467

We are assuming that the characteristic effects of butyl alcohol upon the specific gravity of ethylene dichloride; that is, the slopes of curves for mixtures of ethylene dichloride and butyl alcohol, will be the same as with mixtures of ethylene dichloride and propylene chloride. This assumption is approximately correct for materials containing up to roughly 10% (volume) of propylene chloride. Solution #3 of Table IV which contained roughly 10% propylene chloride was found to vary slightly. Certainly any error due to this discrepancy is of no importance to us, inasmuch as recovered ethylene dichloride will not have propylene dichloride in such large amounts.

#### IV. Analysis of Recovered Propylene Dichloride

While the foregoing discussion has dealt exclusively with the analyses of recovered ethylene dichloride, owing to the fact that samples of ethylene dichloride are more numerous, we have noted that recovered propylene dichloride is contaminated with a certain amount of ethylene dichloride or some material higher in specific gravity than propylene dichloride.

By the same method of analysis, we could measure an increase of gravity induced by a quantity of ethylene dichloride and estimate the quantity quite closely.

We have not considered it necessary to make up known solutions in order to illustrate.

#### V. Nature of Contaminations In Recovered Ethylene and Propylene Dichlorides - According to Effects upon Specific Gravity

##### In Ethylene Dichloride

There seems to be no doubt as to the presence of butyl alcohol and its source is recognized. The source of propylene

Mr. E. R. Taylor

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dichloride in ethylene dichloride is less accountable. If, however, the alcohol present is methyl, for instance, the amount of propylene dichloride or some low specific gravity material would be even greater because a small amount of methyl alcohol would not account for the low specific gravity of recovered ethylene dichloride.

There is a possibility of contamination from two other sources, neither of which have been considered in our calculations on recovered samples. If there is acetone present or still another type of material, namely, a high-boiling hydrocarbon, the source of which is traceable to usage of recovered butyl alcohol in the AP-2000 dope formula, then the magnitude of contamination from propylene dichloride is decreased, since a small amount of acetone or a low specific-gravity hydrocarbon will exert as much influence on the specific gravity of ethylene dichloride as will a considerably larger amount of propylene dichloride.

#### In Propylene Dichloride

We calculate the alcohol of recovered propylene dichloride as butyl, while we recognize that methyl alcohol could very easily be a source of contamination. If we are testing methyl alcohol and calculating it as butyl alcohol (from the OH group) then we are wrong in suspecting the presence of ethylene dichloride, at least, in the quantities reported to date. However, if the alcohol we are dealing with is really butyl then there is no doubt as to the presence of some material higher in specific gravity than propylene dichloride, such as ethylene dichloride.



MLPiker:AM

MH

Nov. 12, 1936

CONFERENCE FOR DISCUSSION OF POSITIVE VS. TENDENCY DRIVES  
FOR M.C. MACHINES - NOVEMBER 12, 1936

The conference which was held to discuss the trend toward positive drives was attended by Messrs. Vanderhoof, Davis, Paddock, Wells, Russell, Davidson, Babcock, Young, Littlefield, Stevens, Killock, Fox, Webb, Larkin, Sears, H.V. Smith. Written comments were made by Messrs. Tubbs and Howland.

The following discussion took place:

It was pointed out that the drives on #44 machine were positive drives (P.I.V.). It was also stated that although tendency drives are installed on #221 and #222 machines, they are so adjusted that there is no slippage between the driver and driven members, and that therefore they may be considered as positive drives.

Different products may require different drive applications. Ray Acetate is a heavy coating and might require different handling. Mr. Vanderhoof pointed out that it would probably be necessary to consider the two types of drives in connection with each type of machine. For example, the skin cannot slip over the dryers, therefore where a positive drive is used we must expect that it will be stretched. If a tendency drive is used in connection with a drum type machine, the difference in speed or tension is compensated for. If the machine is equipped with idle rolls instead of dryers, another condition pertains and here the P.I.V. drives should be satisfactory.

SYNCHRONIZING SPEEDS OF DRIVES

To the question, "Where positive drives are used, how can the speed of the wheel and tension rolls be synchronized", Mr. Vanderhoof stated that either a tendency drive would be required, or a float roll. Mr. Young stated that it was not possible to sub where float rolls are used. The raising and lowering of the float roll is transmitted to the hopper and creates cross lines. Mr. Larkin stated that once speeds were adjusted, no trouble was experienced with the positive drives.

Mr. Littlefield advised the use of a device to determine the amount of tension on the support, whether tendency drives or positive drives are used. Difference in tension will result in different widths. Mr. Vanderhoof stated that a plain float roll would give the relative pull. Mr. Littlefield stated that the machines in Bldg. #53 have such a float roll. Mr. Young stated again that they had never been able to coat color where float roll was used. To the question, "How about the float roll on #44 machine", Mr. Davis replied that this roll was not a float roll but a tension device and it is installed to show what the pull is. The roll moves only 1/16 of an inch. This device is very sensitive.

The opinion of Mr. Webb that the P.I.V. drive on #44 machine was the best we have, was upheld by those who attended the conference. Mr. Larkin pointed out that if a break occurred on #44 machine, the tension rolls would hold the support away from the wheel and prevent trouble and damage. He also stated that less labor was required at the windup owing to the delivery of the support by driven tension rolls.

1/12



#### LOCATION OF TENSION ROLLS RELATIVE TO WHEEL AND WINDUP

The discussion relative to the location of the positively driven tension rolls may be summarized as follows:

To prevent cross lines at the sub hopper, it is believed best to locate positively driven tension rolls just before the first sub hopper after the wheel. This will provide for a constant pull on the support at the wheel and will prevent transmission of snapping or very variable pull to the sub hopper. Relative to the location of the tension rolls for the windup, it was agreed that here the tension rolls should be located between the last dryer and the knurls, and that the knurls should be of the idle type (in which case the support drives the knurls).

At the present time we are depending on driven knurling rolls to draw the support through the machine. Where rolls are to be knurled only half their length, the pull of the knurls is lost during the run of the unknurled portion of the roll, and the tension on the windup shaft assembly must be relied upon to pull the support through the machine.

#### DRIVE THROUGH GEL TOWERS

Messrs. Kallcock and Fox expressed the opinion that positive drives should be used for drawing the support through the gel towers. Mr. Young stated that whatever drive gives the most uniform winding is most desirable. Mr. Vanderhoef stated that it was easier to get the proper tension for winding where the support was delivered to the windup by tension rolls.

In connection with the discussion of the drives as affecting the subbing in the gel towers, Mr. Fox stated that the fabrication of the towers was too light. It was pointed out that opening a window or walking on the gallery would produce cross lines. Mr. Young stated that probably most of the cross lines occur in the sub hopper at the front of the machine and that the gel application merely emphasized the cross lines which originated in the sub hopper.

#### WINDUP DRIVES

To the question, "Should we proceed with the new type of windup which has been designed for Bldg. #20 or should we continue with the equipment which we have in Bldg. #20", Mr. Paddock replied that the shift on the part of Harrow from RP to News might have been due to the wrinkles caused by poor winding (these wrinkles are characterized as the corkscrew type). Mr. Vanderhoef expressed the opinion that the wrinkles might be caused by slackness between the layers of the roll.

Mr. Paddock also pointed out that Canada had received fully-knurled rolls of RP and that there was every indication that there would be a greater demand for completely knurled rolls. This may cause trouble in handling and shipping owing to tendency of rolls to shift. It is therefore advisable to provide for the proper winding of the roll. Mr. Paddock stated that if we could wind tightly enough we could knurl .003 inches above the surface of the support. Mr. Wells stated that there was a possibility that eventually all products would be knurled. Nine out of ten complaints with regard to glaze marks came from unknurled rolls.

All new Cine machines should be equipped for knurling.

The windups in Bldg. #20 are crude, according to Mr. Webb. He does not approve of the use of the lead hammer for adjusting the tension on the core. The windups in Bldg. #53 are much better although at times there is enough difference in the cores to create a difference in the winding of successive rolls. It was pointed out by Mr. Young that the spare core is in the machine in the Bldg. #53 windup, where it is maintained in a clean

condition. Also, it is unnecessary for the operator to run around searching for materials or supplies as they are all contained within the windup.

Mr. Vanderhoof reported that consideration was being given to the installation of new windups for all Cime Pos. and knurled product machines in Bldg. #20. Drawings are being made to change three windups in Bldg. #20, according to Mr. Davis.

Relative to the type of glitter which is most desirable, a statement was made that the razor blade type was satisfactory for acetate but would not be used for nitrate.

It was reported that the signal arm used to show the tension on #221 and #22 machines was of great assistance to the operator. In connection with this, a statement was made by Mr. Fox that #44 and #45 machines were not as well designed as #221 and #22 machines. He stated that three men per brick were being used to operate #44 machine; two men per brick on #45 machine; while only two men per brick and a special floorman are operating #221 and #22 machines (with the exception of two hoppers which are serviced by a helper who is working on standards and is spending only a portion of his time on these hoppers).

In a written discussion by Mr. Tubbs, he stated that the positive driven rolls run more steadily than the tendency driven rolls. In the past, trouble has been experienced with the "frictions wearing out and causing trouble, and also with the tension screw used for adjustment, as the adjustment is constantly being moved by the operator and then another". He also states, "The tension rolls, as they are now installed on #44 machine, make a very good drive, and I think that if the rolls on #45 machine were attached in this way instead of having a separate drive motor, it would have eliminated the trouble that occurred on the machine on one brick on the 11th, when the frame holding the air section rolls was bent".

In a written discussion by Mr. Howland, he states a preference for the positive drive and points out that #44 machine needs less attention when starting, probably due to different arrangement of float rolls. The tendency drive seems to be harder to get settled down when starting up a machine. He is also of the opinion that there are less cinches where positive drives are used. He states that satisfactory winding of rolls is obtained from either positive or tendency driven windups.

Waltham/PP

Mr. Vanderhoof, Little, Padcock,  
Wells, Admitt, Davidson, Babcock,  
Young, Littlefield, Stetson, Hallowell,  
Fox, Webb, Howland.

*Conference*

November 29, 1935

### Stripping on Safety XRay

Mr. Babcock stated that stripping trouble was being experienced on both Blue AA and Class 9 Safety XRay, this trouble invariably occurring at the change from Fall to Winter, and from Winter to Spring. Mr. Gray thought this seasonal change might involve an electrical change in the atmosphere, which might be an important factor in this stripping trouble. In this connection, Mr. Babcock stated that the Emulsion Coating Dept. had recently experienced static trouble on Blue AA. As far as the effect of conditioning of rolls before emulsion coating, Mr. Gray thought that possibly if the gelatin in the sub were in a dry state when entering the emulsion coating machine, it would take a certain length of time for the liquid of the emulsion to penetrate, whereas if the gelatin were in a wet state, it would not pick up water, but only salts. Babcock suggested running three or four hundred feet of tests, on some Blue AA which showed wet stripping - with low humidity on one set, and high humidity on another set.

### Hardener in the Sub

It was stated that Mr. Babcock had suggested using formaldehyde as hardener in the sub on Blue AA, in order to improve the wet stripping, however, this had been objected to because of the possibility of afterhardening trouble. In this connection, Mr. Gray stated that when methyl alcohol was used as solvent for the sub, there was no question but what it gave off some formaldehyde. Mr. Wells stated that some rolls of Safety XRay which on original testing showed wet stripping, had, on being held for a week, shown satisfactory stripping, which indicated that some hardening of the sub had taken place.

### Subbing Gelatin

Mr. Gray suggested an experiment adding various types of salt to the subbing gelatin, step by step, to see if the adherence improved as the amount of salt was increased, however, Mr. Babcock stated that this idea was in use on #49 and #50 machines, where the Blue AA sub used 75% regular and 25% DS gel, but the brittleness was not satisfactory.

Mr. Wells suggested trying an entirely new blend of gelatin, not containing any of the gels now being used. Mr. Gray suggested coating two or three layers of sub on a glass plate, then putting in water at the emulsion coating temperature, 96F, and see how rapidly the sub washes away, however, Nadeau thought that the introduction of subbed support into the NS gel tower on the Roll Coating Machine was a similar and more severe test. Mr. Wells suggested having some of each of the present batches of gel coated on glass plates and tested. Mr. Seal thought that according to the experience on #49 machine, where there had been stripping trouble, with no change in the subbing gelatin, it did not seem that the trouble was in the gelatin but rather in some other factor, and it was believed that more information would be available when P. Bahr submitted his tabulation of data on rolls of Safety XRay showing stripping trouble. In this tabulation are to be included the

the conductivity measurements taken in Emulsion Coating Department. Mr. Babcock suggested measuring the conductivity of a roll of support right at the emulsion coating, and this is to be done.

Mr. Seel asked that Sheppard, Gray, and Nadeau meet to talk over the running of tests on subbing gelatin, also to decide the question regarding the use of hardener in the sub, checking with Mr. Arnold regarding hardeners.

#### Cotton-Gel sub on Safety-XRay

In connection with the subbing of Safety Xray with a cotton-gel sub, Dr. Nadeau stated they were going to make a 300' roll in order to get incubation of film using methyl cellosolve as solvent in the sub.

#### Low Dye Retention film

Mr. Babcock stated they were having trouble in subbing low dye retention Safety Portrait, since in weakening the sub, which is necessary to get low dye retention, stripping trouble is encountered. Nadeau suggested decreasing the amount of gel in the gel sub, keeping the same sub strength. It was also suggested to resub one of the rolls showing stripping. Mr. Seel asked that samples be taken before and after slowing the sub roll, and a test will be run.

MM  
12-2-35

G.B. Babcock

Sub Conference of October 2, 1936

K.C. Film Pack

Trouble was experienced this past week with blisters in the production of K.C. Film Pack. Twelve additional rolls have been coated where 80% of the gel and chemical was used in the sub. Mr. Klem has finished testing a repeat coating where the curl results were obtained at various relative humidities and reports that there is very little difference between the two types of backing. It was decided to get Mr. Seel to OK the approval sheet for the above change after which a greater amount of production of Film Pack will be satisfactory for Pan grade coating.s.

XRay

In order to simplify the storage of the U-coat in the Coating Room, Mr. Babcock suggested that inasmuch as the elimination of the C-sub from class #21 and #25 XRay had caused the nitrogen to drop to .17 to .21%, whereas we are allowed a maximum of .30%, that it would be a good move to use the 5% U-coat on XRay instead of the 4-1/2% U-coat. We would then be using 5% on both Portrait and XRay products and the storage of the U-coat in the Roll Casting would be simplified. Mr. Babcock felt also that the increased thickness of the U-coat would tend to help us from a brittleness standpoint. It was argued by Dr. Nadeau that results of his tests indicate that no improvement in brittleness would be noted, and also that the 5% would be more difficult to apply owing to its somewhat higher viscosity. It was finally decided that if the product was passable from an appearance standpoint, that it would be OK to run one machine on 5% U-coat for awhile, and observe whether any improvement in brittleness can be picked up, and also to simplify the sub storage.

L. S. Cut Sheet

A discussion took place as to the cause of the Pellois stripping on LS Cut Sheet on #31 and 32 machines. It was pointed out that all the stripping involved a separation of the U-coat from the base on the OS side of the support. Mr. Wells suggested that if the sub application could be moved further up in front on these machines that it would be easier to sub because the dope and U-coat would be less cured out.

It was pointed out that previous attempts to extra cure LS Cut Sheet, with ~~XXX~~ Gel sub applied, were ~~XXXXXX~~ a failure due to mottle produced. It would therefore, be necessary to keep the gel subs near the ~~XXXXX~~ windup.

Dr. Carver thought the OS side was better cured and was, therefore, harder to sub. It was pointed out that #32 machine was not as bad for stripping as #31. Dr. Nadeau suggested that the outlet temperature at the point of gel sub application was an important feature of good stripping.

Mr. Babcock stated that the circulating system on both #31 and 32 machines was being closely controlled in regard to acetone content of the U-coat and viscosity. It was necessary to change the formula and ratio of solvents added in the diluting solution to accomplish that control. It was suggested, that since stripping occurred on the OS side only, that the Pellois might be coated on the opposite side, where the sub was weaker and where dye retention would not be experienced, sub change could be made on the opposite side without fear of getting into dye retention troubles, but before this could be done it would be necessary to run a curl test.

#### Kodachrome

A general discussion was started on the trouble experienced by Mr. Scott in the processing of Kodachrome film, in which a minute comb-line effect was produced which caused gradation in the intensity of color. This appeared to be fundamentally the dye retention problem.

A great many subbing tests have been made involving the strength of the sub, the subbing position, chemical in the sub, etc. Encouraging results have been secured from the application of I or J sub at #9 place in the front of the machine. Dr. Nadeau suggested that resin U-coat ~~process~~ process would give freedom from dye retention and might, therefore, help the lines. Mr. Babcock stated that the standard subbing at #8 and 3 places, where gel subs were used, might be improved by using a DS Gel in place of the regular gel in the sub. This would make a more stable sub. In connection with the sub up in front, it was stated that when a weak sub such as J was used that a reticulation occurred, and that as the sub was increased in strength down to D sub, the liney condition appeared. This phenomenon could be observed by a dye dip test. It was agreed that immersion application of the C-sub gave a better appearance than when regular sub hopper method was used, due to the fact that some cross chatter lines were eliminated. It was then agreed to do something toward getting Cine Safety, Cine Kodak, and Recordak products changed over to immersion type sub for the C-sub, so that waste could be saved at the time the hoppers and pans had to be changed.

#### Haze

Mr. Babcock stated that he had arranged to test out a small batch of cotton blend in the U-coats on the coating machine, before recommending that particular blend to be used on a large scale. In this way we would receive a warning if we had a blend of cottons which would cause bad haze trouble.

Dr. Nadeau stated that his experiments to substitute a cotton with high Methyl alcohol solubility for the present cotton of high Ethyl alcohol solubility, were a failure because of poor stripping. For these experiments N510 cotton was used. He stated that one cotton that was showing some interest had a 25% alcohol solubility as was not washed in a cloth bag. Dr. Nadeau stated that further tests on subbing cottons were under way. The compatibility of cottons with various amounts of nitrogen with gelatin was one point to be investigated. Mr. Babcock stated that considerable trouble was experienced in the filtration of some blends of cottons; some filtrations required as seven changes in the filter press, whereas others required only four changes. He stated that a filter test on a proposed blend of cottons would be of value to act as a tell-tale in the necessary time of filtration. Mr. Babcock stated that a better filtration could be secured by filtering with paper pulp thru a Karl Kieffer press. However, the disadvantage of this method is that the press plugs up rather soon.

It was pointed out that more haze would be experienced in the cotton during the summer weather, according to Mr. Folwell, because of somewhat greater hydrolysis due to the higher humidity during the centrifuging process. This reduces a greater quantity of nitro-cellulose back to an insoluble cellulose. Dr. Nadeau stated that a preliminary centrifuging thru a Sharples Super Centrifuge might be a better method of filtration.

#### T.B. Stripping Film

A discussion took place regarding an improvement in stripping off the wheel of Kodalith base when a small amount of steam was added to the coating wheel casing. Mr. VanDerhoef wondered about the flatness when such a procedure was used. It was stated that Pathe used a certain amount of moisture to aid flatness. Mr. Wells stated that a method of adding moisture should be tried on XRay and Portrait to increase production speeds.

5/ pages





## LS Cut Sheet

Mr. Babcock reported that a series of experiments was run where various amounts of acetone from 0 to 30% were included in the C-sub. However, stripping results were not improved in any of these tests.

Dr. Nadeau reported on a set of stripping tests on LS Portrait on #31 and 32 machines in which the present acetone in the U-coat was varied and where fresh U-coat was used in the circulating system. The only one that showed satisfactory results was where the fresh U-coat was used; the results being "Vap H". It was, therefore, decided to put one of these machines on U-coat bottle feed immediately. Later on it was decided to put the OS side only on bottle feed and to include both #31 and 32 machines inasmuch as the OS side showed stripping. Results of ethylene dichloride analysis made on the Nitrate U-coats for the various Portrait machines were reported by Mr. Babcock as follows:

31	1.1%
32	0.29%
55	0.32%

It was not considered that these amounts were sufficient to be of significance. Mr. Couch suggested that the U-coats should be analyzed for softener content.

## Film Pack

No recent trouble has been experienced from blisters on Film Pack since 60% stock has been used in the gel sub.

## Kodachrome

As a result of stripping and dye tests, 5 rolls of Kodachrome base were made applying the CAC at #8 place immersion, D at #7 place regular hopper. Three rolls were also made using CAC at #8 place by immersion, F at #9 place (hot dryer) using regular hopper. The rolls where D sub was applied in the air section at #7 place also showed bad stripping on Testing Department's regular stripping test, however, the one roll coated to emulsion using F sub on the dryer gave good stripping results. We are waiting for Tropical incubation to see whether this type of stripping is good enough for Kodachrome.

It was stated that a belt drive was being installed today at #9 place so that more of this type of product could be coated.

## T.B. Stripping Film

An experiment was run on one of the gel tower machines in building #20 where our gel solution was applied on XRay support to see whether the gel towers would be adequate for gel applications on T.B. Stripping film. It was found that the gel solution supplied by building #30 dried very nicely having, however, a somewhat rough appearance. The thickness was measured of the coating, and the following results obtained: 0.00018 for experiment, 0.00014 to 0.00016 for the standard product.

C O

Sub Conference of October 23, 1936

IS Cut Sheet

A discussion took place on the status of the stripping on #31 and 32 machines. Mr. Babcock stated that the stripping results were Vsp to OK since going to the bottle feed on the OS side. This improvement is felt to be due to the fact that there is less triphenyl phosphate present in the U-coat when applied by the bottle feed than when applied from the circulating system. Actual analysis show as follows:

Circulating system on #32 machine	1.36%
Bottle feed on #55 machine	0.84%

Mr. Wells pointed out that this did not explain why the SS side is still satisfactory for stripping with a circulating system in immersion subbing. It was also pointed out that previous tests had indicated that the SS side contained approximately 25% more softener than the OS side.

Dr. Nadeau showed samples of C-sub and U-coat which had been filtered thru Sharples Super Centrifuge. He stated that the centrifuge delivered 250 gallons per hour including explosion proof motor, and necessary startup equipment could be purchased for 2,300 dollars and could be installed for an additional 200 dollars. They are made out of tin covered steel.

Mr. VanDerhoeft stated that he felt that the subs could be improved with better filtration. Mr. Babcock stated that attempts had been made in the past to filter subs thru stoneware filter equipment, but that method was abandoned due to the danger of loss of solvents while maintaining a vacuum. It was not feasible to apply pressure because stone ware equipment was not built for this purpose. It was eventually decided to take the C-sub and U-coat that Dr. Nadeau had filtered thru the centrifuge and filter same thru Karl Kieffer filter press to still further improve the hazy condition of this solution. It was also suggested that Karl Kieffer press might be used for filtration of gel subs if this press could be lined with silver. If the experimental trial was a success, it was agreed to get an estimate on the cost of installing a suitable Karl Kieffer press. It was decided to deliver samples of support subbed with filtered sub to be sure that stripping results would not be adversely affected by filtration.

Mr. Babcock reported on results of resubbing tests which were run on #10 machine on IS Portrait that showed stripping trouble. It was decided to use DE200 in resubbing this product, inasmuch as stripping results on this one test were OK. It was suggested that it would be an interesting thing to run tests on #31 machine in which softener was deliberately added to the U-coat to see if this would cause peeling on the OS side.

Safety XRay

Although it was decided last week to weaken the sub on one XRay machine, this was not done owing to the fact that the Chemical Plant, by mistake, added 13% of X510 cotton into the F-cotton mixer. It was, therefore, decided to wait until the purer F-cotton was coming thru again before weakening any subs.

A series of rolls coated about one month apart are being set aside, these rolls all to be coated to emulsion about the first of December. This will show us the effect of hardner in NS gel on aging of the rolls.

An approval has been started to cut down the amount of hardner from 1/2 to 1/4 the amount on the XRay machines and also to run one machine without any hardner at all. This is expected to help the stripping on Safety XRay. Dr. Nadeau also pointed out that it would tend to reduce the tendency toward "rabbit track" product if class #25 product were coated.

An approval has been started to coat class #25 XRay on a second machine. This method would avoid the necessity of applying sub in the basement in #3 hopper place on the machine and would please the Safety Department who would prefer to see this operation in the basement eliminated. At the present time it is necessary to carry the bottle up and down stairs. It was suggested that an elevator should be installed to help this situation.

Mr. Couch stated that the sub hopper room at the north end of building #21 was overcrowded and that sub hoppers going past #25 and #26 machines stirred up dirt.

Kodalith

It was stated that Kodalith stripping was coming a great deal better and that most of it was OK for Wire Phot.

Mr. Wells stated that the windup in building #29 was such that an embossed streak was made in the rolls of Kodalith for T.B. Stripping Film and suggested that Mr. Couch should reknurl these rolls on #26 machine. Mr. Couch suggested that heavier knurls should be applied on the original Kodalith coating machine.

Sub Conference of October 30, 1936

Kodachrome

A discussion on Kodachrome lines and stripping took place. Some of the previous results were reviewed. It was recalled that when C-sub followed by regular sub of D strength were both used in the air section the stripping tests were bad. When C sub was used in the air section followed by regular F sub at #9 place on the dryer the stripping came OK but line still showed. A series of subs was then run using DE, E, EF, F, FG, and G at #9 place with dryer. It was discovered that the three weakest subs, namely, F, FG and G showed the best stripping results when coated to Cine Positive emulsion for quick test. Inasmuch as weakening of the sub tends to improve the line condition and since the stripping also improved the five rolls were delivered using FG. These rolls have not as yet been coated.

Dr. Nadeau stated that he had some tests using resin U-coats, mixed cotton gel sub, etc. which should come thru by Tuesday at which time he would report them for the sub minutes.

Dr. Eilers suggested using a gel sub at #9 place containing a smaller amount of gel in order to improve lines. Dr. Nadeau stated that stripping would be worse when this was done. Mr. Babcock suggested that a second application could be applied over the sub with diminished amount of gel.

Dr. Nadeau stated that as far as nitrate application was concerned, that dye retention and stripping were directly comparable. If dye retention could be improved undoubtedly the liney condition could be helped. A resin U-coat would be interesting from the standpoint of dye retention but emulsion skidding and cracking troubles were disadvantageous at the present.

Another method to reduce the dye retention is to apply more gel in the regular sub or to make two applications of sub, Mr. Babcock suggested the use of the Nitrate U-coat with a C-sub or two applications of C sub which would permit us to use a regular sub somewhat weaker than would be possible with only one C sub application which should have a tendency to improve lines and still give satisfactory stripping. After some discussion, it was agreed to deliver five tests covering the following points.

1. C sub in the air section plus gel sub with reduced gel plus a standard gel sub.
2. Two applications of C sub plus two applications of somewhat weaker standard sub.

Immersion Pan on Cine Kodak Products

Mr. Babcock stated that experiments were being run where immersion pan was used for C sub application on Cine Safety, Recordak, and Cine Kodak. If these experiments are successful it will not be necessary to alternate sub hoppers and pans on the Cine Kodak machines.

Safety XRay

A series of tests was run on Safety X-Ray where the regular subs were weakened in order to improve brittleness. It was discovered that all subs from H to J inclusive were OK for wet stripping and it was decided that subs could be weakened somewhat at the present time to improve brittleness without getting us into a tripping trouble. Satisfactory stripping results were secured with the above subs on both Class #21 and Class #25 product.

C O

Sub Conference of November 6, 1936

L.S. Cut Sheet

A discussion regarding the quality of product on the new #33 machine took place. The quality of the product at the present time is satisfactory with the exception of cinches which are appearing in the product which, are not too bad however, to prevent passing the product for regular use but they should be eliminated as soon as possible. Stripping on the rolls from #33 machine is Vsp and OK since the time we started to produce passable material. It was brought out that dye retention and dye lines are not as good as usual at the present time. Dye retention on the three process material and dye lines on the one process material were expected to improve as time went on with the weakening of the regular sub which is on the way at the present time, the effects of which have not shown up in regular coatings. Mr. Wells suggested that if an 8" roll were installed in the regular sub hopper place, we could use a weaker sub and possibly get better dye retention. Mr. Babcock suggested using heat on the 8" roll to improve dye retention.

Dr. Sheppard suggested that there were a number of green dyes that could be used that were water insoluble. It was stated that the green dye leaches out in the developer but the effect is observed again after complete processing. It was again mentioned that dye retention occurred on the OS of Pelloid side. It was recalled that this was the same side which was showing stripping while back and was cured by going to the use of bottle feed on the U-coat application. At the present, the only explanation on improvement in stripping is that the softener content in the U-coat is only about half as much as with circulating system. It was again pointed out that the SS side contains about 25% more softener than the OS side which does not explain why the OS side is harder to stick. It was mentioned that one side might be more porous and would therefore pick up more U-coat. Dr. Sheppard said that his test on wettability had shown a difference in sub pickup between the SS and OS sides.

NS G51 for XRay U-coat

Fog results on the five roll coating of the 3rd batch of NS gel are as follows:-----Fog-----Sensi-----

	Orig.	3 Day	6 day	Speed	Gamma	Fog			
5120-178-1 (check)	.02	.02	.04	.03	.07	.06	600	1.80	.08
2 (3rd batch)	.02	.02	.03	.03	.07	.06	600	1.80	.08
5 (3rd batch)	.02	.02	.04	.04	.08	.08	600	1.85	.13

It was noted that in the sensitometric tests that fog results appeared to be worse as the 5 roll coating progressed and it was decided to have these tests repeated.

### Safety XRay

A set of brittleness tests were shown where the subs were weakened in order to improve brittleness results. It was noted that the weakest sub (J) showed satisfactory for stripping and considerable improvement in brittleness at 10% R.H. It was pointed out that one machine (#47) was being operated on a weaker sub to observe what the effects on stripping and brittleness would be on long-time running.

### Kodalith

Dr. Wilers stated that some condensation was taking place in the Kodalith machines and causing solvent streaks (#53 and #54 machines). He stated that more blankets were placed on #53 to help the insulation and more air was being used in the drying section. It was noted that the air in the coating room had a minimum temperature of about 98F in the summer, and 84 in the winter, and it was stated that if the air was kept at a high temperature condensation troubles would be diminished. Dr. Wilers stated that the ventilating air should be increased on #53, and #54 machine should be shut down to replace #26 dryer.

### T.B. Stripping Film

Mr. Couch showed a sample of Kodalith base that he had processed for T.B. Stripping Film in which crosslines were observed in the middle of the support, and it was noted that these cross lines were a direct result of defects in the sub hopper roll. It was agreed that steps should be taken to use perfect sub hopper rolls in this process to prevent this liney trouble which shows up in the emulsion in spite of the fact that the application is on the reversed side.

### Kodachrome

Dr. Nadeau stated that some of the tests using mixed cotton gel sub and other tests using a cotton gel sub plus gel sub on top of same looked very good and that an additional ~~emulsion~~ emulsion coat over the weekend of the variation of the best tests were coming thru, also a 500' roll will be made of the one that looks the best.

### Haze

An approval sheet for the use of 5% #63 in the nitrate U-coat in place of the 20% quantity has not yet come thru and it was agreed to push this along. It was stated that eleven filter changes were necessary from an F-cotton blend showing average alcohol solubility of 93%, whereas if the average alcohol solubility is 88 to 90% the filter changes are decidedly less. The above is in line with the experience Chemical Plant has had, that is when cottons are produced with high ethyl alcohol solubility the methyl alcohol solubility drops off. Dr. Nadeau stated that further tests were being made on experimental batches of F-cotton that had lower ethyl alcohol solubilities in order to improve that condition.



Sub Conference of November 13, 1936

Printcote

Dr. Nadeau showed a sample of lamp shade material which was made on the Printcote Machine by coating a pigment solution on a transparent base. The appearance of the sample was fairly good as far as uniformity of application was concerned, and it was decided with a little more work this material would be of sufficient good quality to use for lamp shade material. It was thought that if we could get into production of lamp-shade material, we would be able to pay for this machine on this product alone.

Mr. Seel spoke of Mr. VanDerhoef's suggestion to use this type of machine for applying sub on XRay support. In this process, the unsubbed base would first be coated on the regular coating machines after which the rolls could be joined together and processed on the Printcote machine at a higher rate of speed applying all seven sub coats in one operation. A feature of this machine is the ease with which the sub dried. Mr. Wells asked Mr. Kinsella to get out some cost figures on this method of application for XRay.

Safety XRay

Mr. Babcock reported average brittleness results for the past four months on class #21 product as compared with other types, results of which were as follows:

	Av. R.H.	No. of Tests	OS Along	SS Along	OS Across	SS Across
Class #9 checks from winter of 1934 to 1935	11.7%	NS7	22	23	28	29
Class #9 1935 to 1936	13.3%	636 4	25	15	17	9 2
Blue AA	11.9%	411	24	28	21	23
Class #21 July 9 to Nov. 10 (Bldg. #7 dry chamber)	14.0%	631	22	11	15	8

Mr. Seel inquired as to the brittleness on the most recent results and it was stated that this figure was about 10%. Mr. Seel stated that we should do all possible to improve the brittleness of XRay at the present time. Bevaert film appears to be somewhat better for brittleness. This type of film shows "peels H" dry stripping, whereas film being made at Kodak Park shows mostly "vap" and "OK" dry stripping. It is necessary to use a strong sub to secure good wet stripping results and discussion ensued on the possibility of removing hardner from the NS gel U-coat, inasmuch as it was felt that stripping results have improved since the hardner in the NS Gel U-coat has been reduced. With this in mind it might be possible to put on an NS Gel U-coat with no hardner at all, and weaken the sub to the point where "peels h" dry and "OK" wet stripping would be obtained and should

result in a decided improvement in brittleness. It was stated that Mr. Arnold did not wish to remove all the hardner from the gel, and it was decided to assemble some data on various amounts of hardner used and present this data to Mr. Arnold.

A mention was made of an approval sheet that had been started to reduce the hardner from one half to one quarter the amount on four machines, and from one quarter to zero amount on one machine. Mr. Wells asked Dr. Eilers to look this approval sheet up. Dr. Nadeau suggested trying an experiment using increased gel stock in the sub. Mr. Babcock suggested that the controlling factor on dry stripping might be the temperature of the sub in the hopper i.e. with sub maintained at 70 to 80F. and controlled by jacket water, the dry stripping would not be as good as when the sub is allowed to rise to 110F. without the use of jacket water. However, the use of jacket water on single stock sub is apt to cause diagonal lanes. It was stated that #50 machine has been running for some time on class #25, and wet stripping results were practically OK. #49 machine has also been recently put on class #25, and wet stripping results are OK. This process involves the omission of the NS Gel from the OS side, the OS side being the first side coated in the Emulsion Coating department.

The approval sheet to reduce the amount of #63 in the nitrate U-coat from 10% to 5% has recently been received, and it was decided to coat five rolls and observe results of testing before going ahead with this in full production.

It was noted that Mr. McMaster has complained about the brittleness on AP. This trouble occurs during the cutting of the sheets where the emulsion appears to flake off from the dope. It is agreed that this might be some sort of stripping effect. Samples delivered by Mr. McMaster were tested in our brittleness cabinet and found to show nearly all "0" results, and it was felt that this sub should be reduced in strength in the future in an effort to avoid brittleness.

#### Haze

Samples of U-coat were shown which represent a recent filtration experiment. It was noted that the centrifuged sample appeared better than the check, and the centrifuged sample with clam shell was still better; the centrifuge thru Karl Kieffer showed even more improvement. It was stated that several rolls would be coated using centrifuged nitrate U-coat filtered both thru the clam shell filter and Karl Kieffer filter. It was noted that the advantage of centrifuging lay in the fact that changes of filter medium in the clam shell press would be avoided, these changes sometimes being as many as eleven or twelve in a filtration of one 3,000 lb. batch.

Mr. Couch mentioned that some of the stripping film dope supplied by Mr. Lamb using cold washed F-cotton was also showing considerable haze, and it was suggested that an attempt should be made to get Mr. Lamb to run this material thru Karl Kieffer filter.

### Comparison of Brass and Nickel

Mr. Babcock showed samples of brass and nickel that had been soaking in C-sub for about two years. Brass lost .28% whereas the nickel lost nothing in weight. The brass also appeared to be somewhat pitted whereas the nickel still presented a shiny surface. Mr. Couch also stated that he had some samples that had been standing in amyl acetate solutions for several years, and that the brass was completely pitted, but the nickel and tin looked very good. It was decided to make another effort to get rid of the brass faucets, and lines used in handling C-sub and U-coats.

### Kodachrome

Dr. Nadeau showed some samples. In general, he stated that gel cotton subs, where nitrate cotton was used, all showed dye retention trouble whereas acetate cotton used in the gel cotton mixture was much better for dye retention. Dr. Nadeau stated that the stripping could be altered in two ways; one, by the choice of cotton in the mixture and the other by the ratio of cotton to gelatin. Another sample in which two C subs had been applied followed by two applications of G sub showed very good for lines, although some dye retention was noted. Testing Department reports that this sample was OK on wet and heater after results in Kodachrome processing solutions. This was test No. 18314.

### Kodak 816

### Kodalith

Kodalith tests are now being coated to Kodalith gel before releasing for stripping.

### Anti-Static

Mr. Wells stated that on our Cine Negative support the anti-static backing is applied over the dye. He wondered if the acetate could be left off, assuming that the dye would give sufficient anti-static properties by itself. He stated that this would be one method of solving the curl problem on Cine Negative by leaving off the acetate backing application. Mr. Wells stated that it was necessary to use stretchers in building #29 in coating emulsion to Cine Negative, although at one time they were able to emulsion coat it without stretchers. It was decided to deliver a 100 ft. piece of Cine Negative where the acetate backing was omitted and have no stretchers used in building #29 for the coating.

*acetate backing can not be left off. <sup>this</sup> dye stuff  
offers no static protection to nitrate base.*

Printcote

Dr. Nadeau exhibited some samples of resin coatings from the Printcote Machine in which the white pigment had been reduced from 12 to 8%. The samples looked very good except for some crosslines which could be expected to disappear when the tension rolls are properly fixed.

Mr. Seel inquired about subbing experiments on the Printcote machine. Dr. Nadeau stated that these would be started as soon as the U-coat problem was settled. Mr. Seel suggested that some gel solutions for subbing should be made up in the meantime and should be tried on the machine as soon as possible. Mr. Wandervoort stated that the order had gone thru to secure one application roll with six different degrees of etchings.

Centrifuging

In the comparison of samples of X-ray for haze, the nitrate U-coat samples that were centrifuged and filtered thru the clam shell filter showed much better for haze on the support than did the check which was filtered thru clam shell filter alone. Also the samples centrifuged and filtered thru Karl Kieffer filter showed equal if not slightly better improvement. Mr. Seel stated that tests for percent solid should be taken on every batch of U-coat as a control test. He also stated that we should get out an S.E.R. for the centrifuge. Mr. Seel suggested that every batch that goes to the machine should be checked.

One method of control suggested by Mr. Wells was to centrifuge a 5 or 6% solution, after which percent solid could be determined and solution then diluted down to the proper solid content. Mr. Babcock stated that it would involve the installation of at least one extra storage tank.

Mr. Babcock reported that stripping results were solid OK in both cases where the centrifuged and filtered U-coat was used in an X-Ray coating.

Kodachrome

Samples were shown of 35 mm. Kodachrome coated on AP2501 Cine base and subbed with gelva acryloid resin mixture. These samples were open to the objection that the emulsion cracked very easily when folded, thereby destroying a still picture when projected on the screen. Dr. Nadeau stated that this was the characteristic of gelva U-coats and corresponds with the leaving of the emulsion on the tear test. A considerable discussion ensued on the possibility of a plasticized gelatin to help in this situation.

*mt. by  
Shaw-Walker Chem. Co.*

*mt. by  
Robert H. H. H.*

*acetate problem*

Dr. Nadeau mentioned that the "emulsion cracking" defect was not the same as the creeping of the emulsion, which had been observed on some other resin coatings made for Cine purposes.

Mr. Seel was of the opinion that because of a complaint from the trade we should discontinue the resin U-coat at once on this product.

Dr. Nadeau reviewed several different processes of subbing that might be possible substitutes for the gelva-acryloid U-coat, but which, however, would not be free from brittleness. Aside from another resin U-coat containing Santolite, he stated that it might be possible to go to mixed cotton gel or a mixed resin sub where dye retention and stripping are OK and brittleness is bad. He mentioned a mixed acetate gelatin where dye retention and brittleness were OK. Another possibility was to retain the OK dye retention by putting a nitrate U-coat on under the resin. This would also assure solid OK stripping and brittleness. Mr. Seel stated that he would be willing to sacrifice something on dye retention for the sake of eliminating resin U-coats. Dr. Nadeau stated that mixed acetate gelatin sub was the most promising. Mr. Seel asked to have four or five experiments coated to Kodachrome, slit and perforated on 35mm. AP2501. Mr. Seel suggested to Mr. Wynd that further testing should be done on the cracking of the emulsion and suggested that Mr. H. Crouch should do this. Mr. Babcock suggested that a graded acetate AP U-coat might be of advantage in this problem. He also suggested that an experiment with two C-subs followed by two applications of G sub might be of value. In this case the two applications of C sub enable us to use a somewhat weaker gel sub than when one C sub is used. The use of a weak sub tends to improve the dye line condition. Mr. Seel stated then that three or four experiments should be coated with mixed acetate gel sub and at least one experiment with two C subs and gel sub, and another one with one C sub and gel sub. A gel U-coat was to be applied to one of these latter which will help the dye line trouble.

#### Film Pack

In connection with the comet trouble on Film Pack, it was stated that this trouble only occurred when using fine grain developer. The trouble has been definitely located in the support and is due to residual silver which was not sufficiently washed out. The dust strip on the Film Pack machine is being changed every day. No trouble is being noted from comets on the machines that are coating at the present time. It appears that this trouble occurred last summer for a certain length of time, after which we ran out of the trouble.

Mr. Wells pointed out that chemical #5 <sup>nitric acid</sup> was being used in the Film Pack sub, and Mr. Seel saw no reason why we should not continue with it. Dr. Nadeau suggested that chemical #5 be checked for nitrogen content.

Safety XRay- Reduced Hardner

A group of Safety XRay rolls taken at approximately one month intervals will be ready about December 1, to be coated to XRay emulsion at which time we can observe the effect of hardner on stripping, after the base has been allowed to age various lengths of time.

Dr. Eilers stated that he was going to get additional data to present to Mr. Arnold for the purpose of reducing hardner from 1/2 to 1/4 amount in the XRay machines. An approval sheet was started for this reduction several weeks ago.

Safety XRay - Haze

Four rolls of Safety XRay have been made where the #63 content of the Nitrate U-coat has been reduced from 10% to 3%. Stripping was solid OK and appearance was somewhat better for haze. Inasmuch as an approval sheet has been OK'ed, it was decided to go ahead with this change in our U-coat formula.

L.S. Cut Sheet

Resubbing with DE200 did not improve stripping, however, two other rolls resubbed with C200 were passable. It will be remembered in this case that the stripping occurs between the base and the U-coat. Dr. Eilers stated that some trouble was experienced from chattering of the sub hopper. Dye retention on resubbed rolls is bad and this product will be used for clear gel coating only. Mr. Wells stated that we should proceed cautiously with this resubbing and not to coat too many rolls before results are heard from.

Dr. Nadeau stated that #33 machine was coating at a speed of 255 ft. (per 1-1/2 hrs.) as compared with #31 and #32 machines which were coating at 215 ft. Mr. Wells suggested continuing on with the speeding up of this machine without paying attention to the width, inasmuch as a wide hopper was being used. Dr. Eilers stated that London would accept 42-1/2" material and we should not coat narrower product, than this, since they have taken a year's production.

Mr. Seel asked to have the waste cut down and the quality improved. Mr. Wells cautioned to watch the stripping.

Mr. Wells stated that various rolls of product held up for different reasons should be all cleaned up by November 30, in so far as possible.

Kodalith

The most recent stripping tests on Kodalith are coming thru OK. Sub lines appearing on the product coated from #53 machine which was using Kodak hopper and being coated for TB Stripping-Film purposes. No. 54 machine is showing OK for lines and for stripping.

Immersion Subbing

A 50 ft. piece of Cine Safety, Recordak and Cine Kodak where immersion subbing of the C sub was made are coated to emulsion, and we are awaiting results. Nitrogen results were 0.08 to 0.09% on these samples.

OS Subbing of Cine Safety

Dr. Nadeau stated that curl tests would be run as a result of Mr. Babcock's suggestion to apply sub to the OS side of Cine Safety support and solvent backing on the SS side. This change should produce less waste due to changing of sub hopper, inasmuch, as all other Cine Safety products are subbed on the OS side, and frequent changed to and from Cine Safety coatings made on the Safety Cine machine.

Shrinkage Complaint from Vincennes

A letter from Vincennes was referred to in which it was stated that Kodak Pathe were unable to obtain Safety base with a high enough shrinkage at the present time, and would probably have to use acetate of lower precipitation value to accomplish this result.

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L.S. Cut Sheet

It was stated that no product from #33 machine had as yet been coated to emulsion in regular coatings, and it was decided to arrange for a coating of this material at once, inasmuch as a considerable amount of Pan grade material had been made to date.

In connection with LS Cut Sheet, held on account of stripping on the gel side, Mr. Babcock reported on aging experiments where the emulsion coated samples were allowed to stand for 1, 2, and 3 weeks to see if stripping from the base would improve. Results were as follows:

Original test - Peels Easy to Peels Hard  
1 week " - pieces to Very slight peeling  
2 weeks " - large pieces to very small pieces  
3 weeks " - peels hard to small pieces.

It was decided that this method was not practical for reclaiming this material.

In connection with the resubbing operation, there are exactly 12 rolls resubbed but only 50% are passable for stripping. This resubbing was done with C200 sub. It was felt that this sub was not good enough to proceed with. Results of further resubbing tests are noted below.

1. C200	PeelsH	OK	Lp	Gel
	OK	OK	OK	Emulsion
2. B200	Peels H	OK	PeelsH	
	OK	OK	OK	
3. A200	Pieces	OK	PeelsH	
	OK	OK	OK	
4. C200 with 20% #7	Sp	OK	Pc	
	Peels	OK	Vsp	
5. C200 with 20% methyl cellosolve	Sp	OK	Sp	
	Peels	OK	OK	

It was interesting to note that the last two samples showed an improvement in the gel stripping, however emulsion stripping was worse.

A possible method of recovering this material would be to use the sub in either 4 or 5 experiments for gel side and apply C200 for resubbing side.

2 Another alternative would be to waterbox and apply lubricant on #104 machine to the entire stock of material, held for poor stripping, and transfer it to machine leaders, although one roll should be tested before this is done to assure ourselves that the U-coat would not separate in the processing solution in building #5.

*Lubricant is 4.5 grams of crude carnauba wax per gallon of solvent (3)*



This method of cleaning up this stock could be satisfactory to Mr. Paddock, inasmuch as it is necessary to list this material for clear gel coatings after resubbing, and the demand for clear gel coatings is not great at the present time. Furthermore, it is recognized that considerable stock from #31, 32, and 33 machines, which were coated at the time when strogger subs were used, would be available for clear gel coatings. The elimination of the resubbed material would, therefore, increase the percentage of portrait base, which is better for dye retention on green gel coatings. Dr. Eilers pointed out that Mr. Ahold recognized an improvement in dye retention recently since the subs have been weakened on three machines.

content

The results of analysis for butyl alcohol/af the U-coat in the circulating system were to be available for next meeting.

It was decided to repeat the scraping tests on OS and SS sides of unsubbed AP2000 to see whether there was actually a larger percentage of softener on the SS side than on the OS.

#### Kodachrome

As a result of last week's discussion on Kodachrome, Dr. Nadeau ran some experiments using mixed acetate gel sub in addition to others using C sub and gel sub. It was decided to go ahead and deliver two or three rolls using mixed acetate gel sub and these rolls were being coated at the time of this conference on #52 machine. Dr. Eilers stated that the sub was showing some precipitation on the sub roll and it was necessary to change the hopper every third roll. No stripping results from the above coating had as yet been heard from.

Dr. Eilers mentioned that 2,400' of waste was run on Kodachrome product on a startup trying to get the color standard of the Jet backing within Roll Coating limits. Since the amount of Jet being used in Kodachrome backing is more than actually needed for anti halation purposes, Dr. Eilers recommended that the standards on startup should be broadened to cut down this relatively large amount of waste. It was agreed that a short roll of this product should be saved on the next Kodachrome coating, and an experiment run to prove this point.

#### Safety XRay

A question of hardner in the NS gel was discussed. Dr. Eilers stated that "rabbit track" trouble diminishes with the decrease of hardner in the NS gel. He thought that if we had a layer of NS gel that would take the emulsion a little better it would improve the "rabbit track" situation at the present time on class #21 and class #25. Mr. Babcock suggested putting thru a 10 roll coating using no hardner at all in the NS gel as a follow-up experiment on a previous 5 roll coating which was OK for stripping, and it was agreed to do this.

Mr. Babcock reported that NS Gel batch #1826, which showed somewhat more fog than usual on sensitometric tests several weeks ago, has been retested and is now comparable with checks and is passable to be used with regular products.

Dr. Eilers spoke about a complaint received Wednesday morning from State Street on Safety Blue NS Cut Sheet with regard to the depth of color in the base. Upon checking it was found that the differences in color compared with our color standards were quite passable.

#### Haze in the U-coat

Mr. Babcock reported that three groups of rolls: (a) using 5% #63 in U-coat instead of 10%, (b) using U-coat passed thru centrifuge and clam shell filter, (c) using U-coat passed thru centrifuge and Karl Kieffer filter, haze all been coated to emulsion and the stripping is solid OK on the rolls. All of the entire rolls are better for haze than the standard product now running.

Mr. Couch reported that Mr. Folwell had made some ash determinations on F cotton used for Stripping Film Dope solution and had reported 0.99% ash found before and 0.66% ash after filtering thru a Karl Kieffer press. Dr. Eilers suggested that paper pulp was an absorption agent for the ash. Mr. Babcock suggested that the haze filtered out might be responsible for the lowering of the ash content. It was agreed to check with Mr. Folwell and get further information on this point, and also determine the percent ash before and after centrifuging on nitrate Stripping Film Dope.

#### Trace of Iron in #12

Mr. Babcock reported that two recent batches of recovered #12 received at building #45 for sub making purposes have shown a bluish color when chemical #1 was added, indicating the presence of iron. This solvent was then rerouted to be used only in C-sub and U-coat, and only new #12 was used in gel subs until these batches have been used up. Samples of the contaminated solvent were delivered to Dr. Nadeau for examination.

#### Method of Improving Brittleness

Mr. Babcock suggested the use of ethyl alcohol for sub making to improve brittleness on Safety Xray. It appears that high methyl alcohol solubility is not desirable for good subbing cotton, inasmuch as the N510 cottons tried out recently all show poor stripping. This, therefore, at the present time, means high ethyl alcohol solubility which we are using now is giving the best results so far as is known. If, therefore, ethyl alcohol is used as a solvent in making up a gel sub, it will exert a stronger attack power on the ethyl alcohol soluble cotton being used in a U-coat than if methyl alcohol were used in the gel sub. The use of ethyl alcohol in the gel sub should make it possible for us to use a considerably weaker sub which might give us the desirable property of OK wet stripping and "pcs" to "peels h" for "heaterafter" results. It was agreed that a few of these subs should be tried during the coming week.

-4-

Kotava

Dr. Eilers reported that stripping was noted on the last coating of Kotava base which consisted of resubbed rolls. It was noted that when this Kotava was made last summer, Mr. Young used PR cotton with Kotava pigment instead of F cotton which had been the previous practice, and that stripping trouble was noted when the above change was made, and was partially corrected by the use of 50% #7 in the C sub. However, it is agreed that from the stripping standpoint the use of F cotton was better, and it was decided to suggest to Mr. Young that in future coatings he take F cotton filtered thru Karl Kieffer press or centrifuged to remove the haze after which this material could be used with pigment for Kotava coatings. It was agreed also to look up the data on Kotava and find out where Mr. Young started to use the PR cotton.

Kodalith

In connection with a recent coating, 5554-208, of Kodalith in which four out of five rolls showed bad stripping, the following information was presented by Mr. Babcock.

Roll #1 was released by us on the basis of regular testing and was OK for wet stripping.

Roll #2 was marked "Retest". However, it was taken by building #29 and coated and gave "Str.E LE S1".

Roll #3 was released by us on the basis of Cine Positive testing and showed "str" and "LE". This method of testing has now been discontinued in favor of Kodalith gel.

Roll #4 was marked for TB, however, building #29 coated it to Kodalith. Result was "Str LE S1".

Roll #5 was not available and was therefore, not classified as per recent method of Kodalith classification. Building #29 coated this roll to Pelloid and stripping results were "StrH LE S1".

Mr. Wells suggested that this information be given to him in a letter which could be forwarded to Mr. Cook for his information;

During the last week 44 tests were coated to Kodalith base using Kodalith gel only, all tests being from #54 machine with immersion subbing and 86% was OK for stripping.

In a discussion on wet stripping trouble on Kodalith it was agreed to look up the regular coatings for the past two years to scan the wet stripping experienced with Kodalith gel sub.

Dr. Eilers suggested using a weak gel sub followed by two NS gel coatings on Kodalith base for TB, doing same on #53 machine after which glue could be put on over the NS gel near the windup using 145F dryers at first and fourth places and tapering to about 180F. Mr. Wells approved of this experiment and Mr. Couch suggested that an improvement from appearance standpoint could be made on TB base by using C sub and weak gel sub coating at a lower dryer temperature. However, Mr. Wells stated that the higher dryer temperature was required for flat sheet and also to keep the shrinkage down.

Mr. Wells suggested that one of the machines with two pans in the gel tower could be used and gel application made in the tower with high temperature curing on the dryer.

Percent Solids in the Nitrate U-coat

Following up Mr. Seel's suggestion of last week that percent solid should be determined on U-coats as supplied to the coating machines in building #20, we are listing below as a matter of record, some results secured at the present time on the XRay U-coat as follows:

x996	Batch 7	Solid	3.51	3.52
x996	" 8 and 9	"	3.56	3.57
x996	" 10	"	3.56	3.57
x996	" 11 and 12	"	3.68	3.68
x996	" 13 and 14	"	3.54	3.55
X1006	" 1 and 2	"	3.65	3.66
X1006	" 3 and 4	"	3.51	3.52
X1006	" 5	"	3.50	3.49
X1006	" 6 and 7	"	3.52	3.52
X1006	" 8	"	3.50	3.49

1/1/42

C O

Sub Conference of December 4, 1936

Kodalith

(a) For Dental XRay

A discussion was held on production of Kodalith type base for Dental XRay, and it was noted that the next coating should be made on #53 machine using C sub and Gel sub. It was expected that the speed on #53 machine could be raised from 375 to 400'. Dr. Eilers stated that the last coating of Dental XRay which had previously tested with Kodalith gel, and found to be OK on test, was OK after the final Dental XRay coating, this amounts to 6200', and the subbing was the same as for ordinary Kodalith base, i.e. single gel sub applied at #7 and #8 places.

However, it should be noted that the above coating is 5351, which is only one of three different types of Dental XRay commonly coated on Kodalith base. The type of Dental XRay showing the most stripping trouble is 5207. The coatings on 5207 have been looked up and it has been determined wet stripping troubles began approximately January 1, of this year. Since that time several coatings have shown bad for wet stripping until recent coatings made in October when C sub and Gel sub were used.

It is interesting to note the order of emulsion coating of the three different types of Dental XRay on Kodalith base.

5207	#1	coat OS	side	Gel	Wet stripping bad during the year.
	#2	" SS	B	Emulsion	
5351	#1	" SS	"	Gel	" " OK " " "
	#2	" OS	"	Emulsion	"
5352	#1	" SS	"	NS Gel & Emul	Wet stripping OK during
	#2	" OS	"	Emulsion	the past year.

Mr. Babcock reported stripping results secured on two samples of single subbed Kodalith base, one of which showed bad wet stripping and the other OK wet stripping when coated to Kodalith gel. The above two samples were coated to 5120 XRay, and results were "sp" to "OK" on dry test and "OK" on wet test. One piece we coated to 5351 Dental XRay on one side only, dry stripping was OK and wet stripping was "vs1".

It should be noted, however, that the type 5207 Dental XRay which was worse for wet stripping was not used on the above coating because it was not ~~available~~ available.

(b) For T.B.Stripping Film

Mr. Wells stated that the stamping on the edge of the last T.B.Stripping Film shows thru on the thin skin which latter is applied from nitrate dope. Inasmuch as words read "Eastman Kodak Safety Film", this is confusing to the customer. Mr. Armstrong is taking this matter up with Mr. Seel.

Mr. Babcock reported inventory showed that there was sufficient T.B. raw base on hand to last thru December, or 26,000'. However, Mr. Couch stated this might not be enough. It was noted that recent figures from Mr. Paddock on sorting waste on T.B.Stripping Film were 20 and 17% which are considerably lower than in the past.

Dr. Eilers stated that another wheel would be needed on #54 machine before Kodolith or TB or Wire Photo grade could be coated. Inasmuch as it had been decided to use C sub and Gel sub method for delivering Dental XRay on Kodolith base, it was suggested that when #54 machine went down for a new wheel that two more subbing stations should also be supplied similar to #53 machine.

Mr. Couch stated that the experiment using a gel sub followed by NS gel had been run on #53 machine for TB. However, when the dope was applied later on #25 machine it showed a bad craze effect. This crazing originates due to the cracking of the gel and it is case in the dope when the dope is drying down.

A discussion on softener for gelatin took place, and it was noted that the next time this experiment is repeated, that glycerin would be used to help the craze effect. Dr. Nadeau stated that the solvent from the dope caused the crazing. Mr. Couch said that they had various experiments on hand to be coated including five samples of different concentrations of glue applied on #25 machine. He stated that an experiment had been run on #53 machine applying glue after which dope was applied on #25 machine, and a sample from one end would not strip. Either they did not get any glue on #53 machine or dope on #25 machine. This roll has been held up.

Mr. Babcock stated that the Gloucester glue used in Stripping Film coating is very corrosive on our silver lined kettles and it would be preferable from the sub making standpoint to use Mr. Bruce's glue. Mr. Couch agreed to round up the experiments and put in an approval sheet. It was stated that 500 or 600 lbs. of Gloucester glue were on hand at the present time, and that this cost 14 ¢ per lb. whereas Mr. Bruce's glue might cost considerably more. It was agreed to check up on the relative cost of the two types of glue before starting an approval sheet.

(c) For Regular Type

Contrary to the general opinion, that we have had wet stripping on Kodolith for the past two years, the records have been examined and it was found that on regular Kodolith no wet stripping of any importance was encountered until March of this year. It was felt that possibly an emulsion or gel change might